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WATER QUALITY DATA FROM TRUCKEE AND CARSON RIVERS. PYRAMID LAKE AND LAHONTAN RESERVOIR, A WORKING PAPER

Environmental Protection Agency
San Francisco, California

October 1971

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Recommends operating criteria and procedures that would maximize the use of flows required to meet the water entitlement of the Truckee-Carson Irrigation District (TCID) and to minimize diversion of the Truckee River so that as much water as possible could be provided to Pyramid Lake. Developing such recommendations involved making economic, population, and waste load projections; predicting the effects of planned development projects and proposed management plans, and determining water needs within the river basins.

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WATER QUALITY DATA FROM TRUCKEE AND CARSON RIVERS, PYRAMID LAKE AND LAHONTAN RESERVOIR

A WORKING PAPER*

October 1971

* A Working Paper presents results of investigations which are to some extent limited or incomplete. Therefore, conclusions or recommendations, expressed or implied, are tentative.

Environmental Protection Agency
Region IX
San Francisco, CA 94102

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I. INTRODUCTION

BACKGROUND

In 1964, the Secretary of the Department of the Interior created an interagency task force to develop plans for water resources management in the Truckee and Carson River basins. Called the "Interior Committee on Operating Criteria and Procedures: Truckee and Carson Rivers", the group consisted of representatives from the Bureaus of Reclamation, Indian Affairs, Sports Fisheries and Wildlife, Outdoor Recreation, the United States Geological Survey, and the Federal Water Pollution Control Administration (FWPCA).*

One of the Committee's responsibilities was to recommend operating criteria and procedures that would maximize the use of flows required to meet the water entitlement of the Truckee-Carson Irrigation District (TCID) and to minimize diversion of the Truckee River so that as much water as possible could be provided to Pyramid Lake. Developing such recommendations involved making economic, population, and waste load projections; predicting the effects of planned development projects and proposed management plans, and determining water needs within the river basins.

PURPOSE AND SCOPE

The FWPCA was responsible for:

1. The development and projection of water quality criteria and baseline data pertaining to the Truckee and Carson Rivers.

2. An appraisal of flow requirements and/or alternative methods of waste control necessary to meet water quality standards in this system.

The FWPCA conducted two field surveys in August and September of 1968 to characterize existing water quality and to provide guidance for projecting future conditions. A network of

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* Effective December 2, 1970 under Reorganization Plan No. 3, the Federal Water Pollution Control Administration officially became the Water Quality Office of the Environmental Protection Agency.

twenty-seven sampling stations was established over the Truckee-Carson River basin system. Seventeen stations, many coinciding with points used on earlier surveys, were located on the Truckee River and its tributaries between Reno and Pyramid Lake. Of the ten remaining stations, one was located on the Truckee-Carson Canal just below Derby Dam; one on the Carson River, six miles upstream from Lahontan Reservoir; three in Lahontan Reservoir; and one downstream from Lahontan Dam in the "V" Canal. Four stations located on Pyramid Lake were sampled in October because of inclement weather during the field surveys.

The survey crews measured electrical conductivity, pH, temperature, dissolved oxygen, and turbidity in the field. Total Dissolved Solids (TDS), phosphorus, nitrogen, hardness, sodium, potassium, boron, suspended solids, and replicate conductivity samples were analyzed in the laboratory. Planktonic respiration rates, based on light and dark bottle experiments, were measured in the Truckee River near Reno and in Lahontan Reservoir. Coliform bacteria counts were made at eight stations on the Truckee River during both the August and the September surveys.

ACKNOWLEDGEMENTS

The Truckee-Carson Basins surveys were conducted with the cooperation of the State of Nevada. Valuable assistance in pre-survey planning was provided by Thomas Trelease, Chief of Fisheries, Nevada Fish and Game Department, and by his staff. Coliform bacteria samples were analyzed by the Division of Health, Nevada Department of Health and Welfare. Assistance in sample collection was also received from Dr. John D. Sharp, Desert Research Institute, and from University of Nevada student assistants.

Nelson Thomas, of the Technical Assistance and Investigations Branch of the FWPCA, Cincinnati, assisted in the performance of algal photosynthetic and respiration tests.

Personnel from the FWPCA Laboratory, Alameda, performed the services listed and may be contacted for further information.

Report composition.....David R. Minard
Benthic organisms.....Arthur Noble
Field operations supervision.....James Robertson
Photosynthesis and respiration.....Charles Seeley
Chemical analysis.....Gerald Burke

II. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

1. The dissolved solids concentration in Pyramid Lake is increasing because the Lake's evaporation rate is exceeding its inflow rate.

2. Evaporation and nutrient-containing inflow contribute to the increase in the nutrient concentration in Pyramid Lake and Lahontan Reservoir.

3. Total phosphate levels between the stations at Steamboat Creek and Derby Dam exceed those levels established by the water quality standards for the Truckee River.

4. Truckee River temperature immediately downstream from the Tracy power plant exceeds the Nevada State Thermal Standards.

5. Measured phosphate levels on the Carson River stations at Muller Lane, New Empire, and Weeks exceeded the water quality standards established for this river.

RECOMMENDATIONS

To protect fisheries and recreational uses and remain within State water quality standards, the following actions are recommended:

1. Nutrients should be controlled in the Truckee River above Derby Dam, and in the Carson River above Lahontan Reservoir.

2. Salinity should be controlled in Pyramid Lake to approximate present levels.

3. Temperature should be controlled in the vicinity of the Sierra Pacific Power Plant at Tracy.

III. STREAMFLOW AND WASTE DISCHARGE IN THE TRUCKEE-CARSON BASINS

The Truckee River flows from Lake Tahoe north around the end of the Carson range, east through Reno, along the base of the Virginia Range, and north to its termination at Pyramid Lake. It courses approximately 100 river miles.

The west fork of the Carson River originates in the Carson Mountain Range south of Lake Tahoe and converges with three other major tributaries near Minden, Nevada. From there it meanders 65 miles through the desert south of the Virginia Range to the Lahontan Reservoir. Below the reservoir it flows for another 35 miles, is depleted by diversions, and eventually disappears into the Carson Sink. Irrigation demands by the Truckee-Carson Irrigation District (TCID) account for most of the diversions. Some flow continues to the Stillwater Wildlife Management Area, a waterfowl refuge. This area, however, depends primarily upon waste water returns from TCID for its supply. Any water which eventually reaches the Carson Sink is lost to evaporation and percolation.

The Truckee-Carson Canal links the Truckee and Carson Rivers. Built in 1905 to provide water to TCID, the canal originates at the Derby Diversion Dam on the Truckee, parallels the river for 10 miles, and then winds around the east end of the Virginia Mountain Range for another 20 miles until it reaches the north end of the Lahontan Reservoir.

Annually, between March 15 and November 15, a major portion of the Truckee River is diverted through the Canal, leaving an insufficient flow to counter the evaporative losses of water from Pyramid Lake.

Figure 1 shows the geography of the Truckee and Carson River basins system, while Figure 2 shows a schematic diagram of streamflow from Reno downstream on the Truckee, and from the tributary confluence downstream on the Carson River. Locations of all sampling stations and waste dischargers are indicated. Table 1 lists mean stream flow data obtained during sampling days in August and September, 1968, together with average annual flow values.

Table 2 lists dischargers within the study area. In addition to these municipal waste inputs, irrigation return water drains into the Truckee and Carson Rivers at numerous points, contributing as yet undetermined amounts of dissolved solids, nutrients, and pesticides.

IV. LOWER TRUCKEE RIVER

FIELD AND LABORATORY MEASUREMENTS

Eighteen stations between Reno and Pyramid Lake were sampled at two-to three-hour intervals during the two 24-hour surveys in August and September, 1968. Of these stations, fourteen were located on the Truckee River, two on Steamboat Creek, one on the North Truckee Drain, and one on the Truckee-Carson Canal below the Derby Diversion Dam. Figure 3 shows the station locations, and Table 3 describes each.

Table 4 lists the field measurements obtained during the two surveys. Weather and river conditions prevented field crews from completing the entire sampling schedule during the August survey, although diurnal variations in dissolved oxygen, temperature, and pH were evident at most stations during both surveys. Electrical conductivity was measured with an RB3 Solu Bridge, dissolved oxygen with the azide modification of the Winkler method, temperature with a mercury thermometer, pH with a Beckman Model N meter, and turbidity with a Hach colorimeter. Since the river was shallow and well-mixed, surface grab samples were taken.

In addition to periodic measurements, two continuous records were made of water temperature in the vicinity of Tracy power plant. Figure 4 shows the thermograph records made from sampling stations located immediately above and below the power plant dicharge. These show the effects of cooling water on the river temperature.

Other field work included estimates of planktonic and benthic algal respiration rates as determined from dissolved oxygen changes in light and dark bottles. The planktonic respiration rates (Table 5) were estimated at three stations in or near Reno during the August survey, while estimates of benthic algal populations (Table 6) were made at six stations between Reno and the S-Bar-S Ranch during the September survey.

Replicate samples were collected at each station during the two surveys (Table 7) and analyzed at the laboratory of the Klamath Falls Field Office according to procedures described in FWPCA Methods for Chemical Analysis of Water and Waste Water (November, 1969). Results of the laboratory analysis show that, in general, the electrical conductivity values

agree with those measured in the field. Electrical conductivity, or TDS, in the Truckee River increased substantially following its confluence with Steamboat Creek. A similar increase occurred between Derby Dam and Nixon.

Table 8 lists the total and fecal coliform bacteria measurements at eight stations. Samples taken for this test were promptly processed at the Nevada State Department of Health Laboratory in Reno.

CHLOROPHYLL

Truckee River samples for chlorophyll measurements were taken on three dates. Series H samples were taken one week prior to the August survey, while series I and M samples were taken during the August and September surveys, respectively. Duplicate samples were taken at each station so that both *in situ* algal growth and algal growth potential could be measured.

Samples for *in situ* algal measurement by chlorophyll determination were filtered through glass fiber filters immediately after being collected. The residue on the filter was then preserved with $MgCO_3$, frozen, and dessicated in the dark. When ready for processing, the filter and residue were ground, mixed with an acetone solution, and centrifuged. The fluorescence of the supernatant solution, measured with a fluorometer, gave a measure of the chlorophyll *a* and thereby the algal biomass of the sample.

The algal growth potential (AGP) samples were stored in dark, cool containers until they were incubated at 20°C under a constant light source in the laboratory. Algal growth was then monitored over a two-week period by measuring the fluorescence of the algal chlorophyll *a*. The intensity peak, which generally occurs within two weeks, indicates the maximum growth possible for algae at a single location under optimum conditions.

Table 9 lists fluorescence values for both the *in situ* samples and the AGP studies. The factor for converting chlorophyll *a* to total plant carbon averages approximately 45.

Figures 15 through 17 show the initial and peak values of the samples, as a function of river miles, between Reno and Nixon.

WATER QUALITY STANDARDS IN THE TRUCKEE RIVER

Table 10 lists the water quality standards adopted in 1957 (amended, 1967) by the Nevada State Board of Health for four Truckee River control points. In general, project measurements made during the August and September surveys were within State standards. Total phosphate levels between the Steamboat Creek and Derby Dam stations, however, exceeded these limits. The State standard at Lagomarsino (Lockwood Bridge), for example, limits any single acceptable value to 0.6 mg./liter as phosphate. The September survey revealed a 0.77 mg./liter concentration of total phosphorous as phosphorous, or by conversion to phosphate as phosphate, a level of 2.53 mg./liter, more than 4 times the State limit (Table 7).

River water temperature measured immediately downstream from the Tracy power plant also exceeded the State standards. At Lagomarsino, the summer limit was 22°C, while the thermograph trace recorded below the Tracy plant (Figure 4) shows a water temperature exceeding 26°C.

The pH levels exceed the State standards at the Booth Street, Boynton Lane, and S-Bar-S Ranch stations (Table 4).

BENTHIC ORGANISMS

Benthic invertebrate samples were collected on a one and one-half by three foot hand screen with 0.5 mm. openings (Figure 2). Rocks and gravel in a 4 square-foot area were brushed and roiled so that organisms present broke loose and became entrapped on the screen. The trapped material was washed into a large bucket and the screening process was repeated several times at different depths, flows, and substrates, until all habitats at each station were sampled. The content of the bucket was then poured through a US-35 sieve with 0.495 mm. openings. All residue was placed into wide-mouth quart jars and preserved in 10% formalin.

Over 45,000 benthic invertebrates were collected during the sampling period. Of this total, 7,455 were proportioned, identified, and counted (Tables 10 and 11). Identification was by genus, in most cases, and totalled 45 different taxonomic groups.

Of the organisms sampled above the Reno-Sparks area, 78 to 93 percent sampled were true flies (Mayflies, Stoneflies, and Caddis flies). The predominance of these organisms indicated the high water quality of this reach of the Truckee River.

Samples taken in the vicinity of the Lockwood Bridge, Patrick Siding, and Tracy stations showed an increase in the numbers of flatworms, segmented roundworms, and amphipods. This occurrence indicates a progressive decrease in water quality. Correspondingly, a decrease in the population of Mayfly larvae, which can only grow in relatively unpolluted conditions, was noted. At the S-Bar-S station, the predominance of flatworms and segmented roundworms, which can grow in highly polluted water, indicated a high concentration of organic materials.

The presence of various types of organisms indicates, in the manner of a bioassay, which conditions are suitable for various beneficial uses of the river.

The predominance of certain organisms can indicate unsatisfactory conditions other than chemical pollution. At the Tracy power plant, the effluent cooling water at the outfall is 21°C warmer than the receiving water. The increased temperature in the area affected by the discharge plume constitutes thermal pollution where it exceeds the tolerance levels of

local and migratory organisms. Near the outfall, the benthic species capable of survival are limited primarily to blue-green algae and certain midge larvae.

The predominance of scavenger flatworms in the "V" Canal below Derby Dam indicates a significant decrease in water quality. This condition can be caused by impoundment which, together with concomitant lowering of velocity, causes suspended solids to deposit on the bottom of the lake as sludge. The organic detritus in the sludge supports a large population of scavenger flatworms. A similar occurrence has been described by Spence and Hynes.*

---

* Spence, J. A. and H. B. N. Hynes, "Differences in Benthos Upstream and Downstream of an Impoundment, "Journal of Fisheries Research Board of Canada, Vol. 28, No. 1, January 1971, pp. 35-43.

V. PYRAMID LAKE

Sampling at Pyramid Lake stations (Figure 18) was first attempted on September 19, 1968, immediately following the second Truckee River survey. Water samples from selected depths were collected for laboratory analysis using a messenger-actuated Van Dorn bottle. Inclement weather, however, limited the number of discrete samples taken and prevented any field measurements or analyses. Table 13 shows the results of laboratory analyses. Because of wind drift, the locations and depths shown are approximate values.

On October 9, weather conditions were excellent and all four stations were sampled (Table 14). Discrete samples were taken simultaneously at several depths for each station using Nansen Bottles. This method, customarily used in oceanographic surveys, involves clamping a series of reversing metal bottles to a wire at desired intervals. The wire with its bottles is then lowered to a predetermined depth and tripped by a chain reaction of messengers which causes the bottles to turn upside down and to entrap samples of water. Continuous vertical profiles of temperature and conductivity were made at Stations 2 and 4 with an in situ salinometer. Temperature profiles were also taken at each of the four stations with a bathythermograph.

Figure 19 shows vertical profiles of temperature and dissolved oxygen concentration measured in the field, and of conductivity determined by laboratory analysis. The well-mixed layer was nearly isothermal. A sharp thermocline, across which the temperature fell by 12°F in six feet, began at 73 feet. Below depths of 160 feet, the water was almost isothermal at 44°F. Conductivity in the well-mixed layer varied from 8750 to 9000 micromhos/cm. At 255 feet, it dropped to an almost homogeneous value of 8630. Dissolved oxygen values were almost homogeneous both horizontally and vertically throughout the well-mixed layer. They averaged 7.8 ppm. dissolved oxygen in this segment of the water column although they dropped to 3.4 ppm. of dissolved oxygen in the deepest part of the Lake (330 feet).

Table 15 lists the laboratory findings from the October 9 samples. The samples were analyzed in the laboratory of the Klamath Falls Field Office using methods described for the Truckee River samples. The conductivity measurements of the September 19 samples (Table 13) and those in parentheses in Table 15, were made at Klamath Falls with an

Industrial Instruments RB3 Solu Bridge. The remaining specific conductivity values (Table 15) were determined in the California-Nevada Basins Office of the FWPCA with a Beckman conductivity pipette cell. Based on the values in these tables and on earlier measurements, the specific conductivity can be correlated to total dissolved solids concentrations in mg./l by multiplying the EC, (in micromhos/cm.) by 0.62.

Figure 20 shows the historic trend of dissolved solids increase in Pyramid Lake. It also illustrates the accumulation of TDS in the Lake since the construction of Derby Dam in 1905 and the diversion of Truckee River water from the Lake. Table 16 shows the water quality trends since 1882. As a result of reduced flow, the TDS has more than doubled.

VI. CARSON RIVER

Weeks was the only Carson River station sampled during either August or September, 1968 (Figure 21). It is located about six miles upstream from Lahontan Reservoir at Highway 95, near the USGS Fort Churchill gauging station. Data from the August, 1968 survey are shown with comparative data from a 1966 survey (Tables 17, 18, and 19).

Data from other stations were obtained in 1969 (Tables 17 and 18). Three stations were located on the Carson River proper, one downstream from the Carson City waste water treatment plant, and two a few miles upstream. Two stations were located on tributaries of the Carson, one on the east fork of the river and the other on Brockliss Slough. Sampling was conducted to provide baseline data for comparison with future water quality measurements. Two samples were taken from each station, one under high and one under low flow conditions.

A comparison of data obtained (Table 18) with the water quality standards (Table 21) shows that concentrations of total phosphorous (as PO_4) are already exceeding standards at the Muller Lane, New Empire, and Weeks stations. Additional nutrients being exported from the Lake Tahoe Basin to the Carson River Basin will cause even higher nutrient levels.

The only sampling station downstream from Lahontan Dam was located on the "V" Canal. The canal, part of the USBP Newlands Project, is a major delivery channel for TCID. It originates on the Carson River about four miles downstream of Lahontan Dam and is controlled by the Carson Diversion Dam. Laboratory analysis of the "V" Canal sample are listed in Table 20.

VII. LAHONTAN RESERVOIR

Lahontan Dam impounds water from both the Carson River and Truckee River. Built in conjunction with the Truckee Carson Canal, the dam controls water flow to the Newlands Project for the TCID.

Figure 22 depicts the three Lahontan Reservoir stations sampled during the August 1968 survey. Approximately 18 miles long, the reservoir ranges in width from less than one-quarter mile to more than one and one-half miles. Its depth averages 15 to 20 feet, and extends to 60 feet near the dam. During the spring months, the reservoir is full and contains more than 260,000 acre feet of water. At the peak of the irrigation season, the volume drops to about 90,000 acre feet. There is a 27-foot difference in surface elevation between the minimum and maximum surface levels.

Tables 22 and 23 list field and laboratory measurements made during the 1968 survey, and Table 24 shows comparative measurements made in 1966. The 1968 figures point up the deterioration of water quality which occurs with increasing distance from the dam. The degradation which results from poor circulation in the reservoir is particularly evident in its total phosphorous levels and turbidity.

The configuration of the reservoir (Figure 22) indicates that flushing effects of the Truckee water are confined to a small area at the Lake's north end.

Since incoming canal water simply shortcircuits to the dam, circulation occurring in most of the reservoir results from the effects of wind and the Lahontan Dam releases which exceed canal inflow. Table 25 shows that the mean inflow rate of the Carson River during August was considerably less than one cubic foot per second (cfs) while the canal inflow was almost 150 cfs. The Truckee and Carson Rivers contributed 9,120 acre-feet during a period when 48,541 acre feet were released for irrigation. Thus, 39,421 acre-feet were taken from the impoundment at that time.

Like the Truckee River, the Lahontan Reservoir has phosphorous concentrations which are considerably higher than those allowed by standards imposed. The Silver Springs station, for example, registered a phosphorous value of 0.625 mg./liter as P at four meters. This is equivalent to a value of 1.92 mg./liter as phosphate. Since the standard for this Lake is 0.60 mg./liter as phosphate, the observed Lake concentrations exceed the standards by a factor of three.

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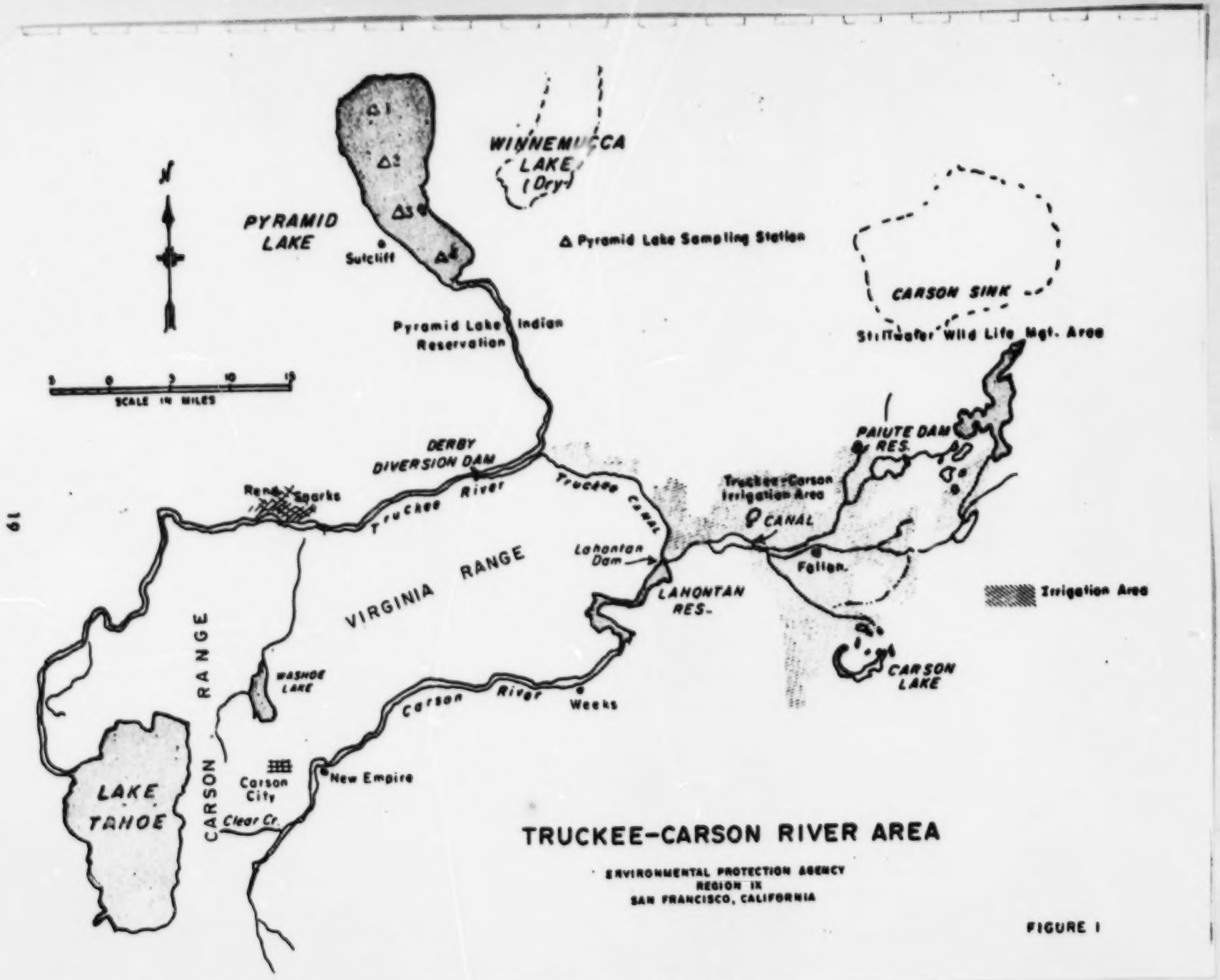

TRUCKEE-CARSON RIVER AREA

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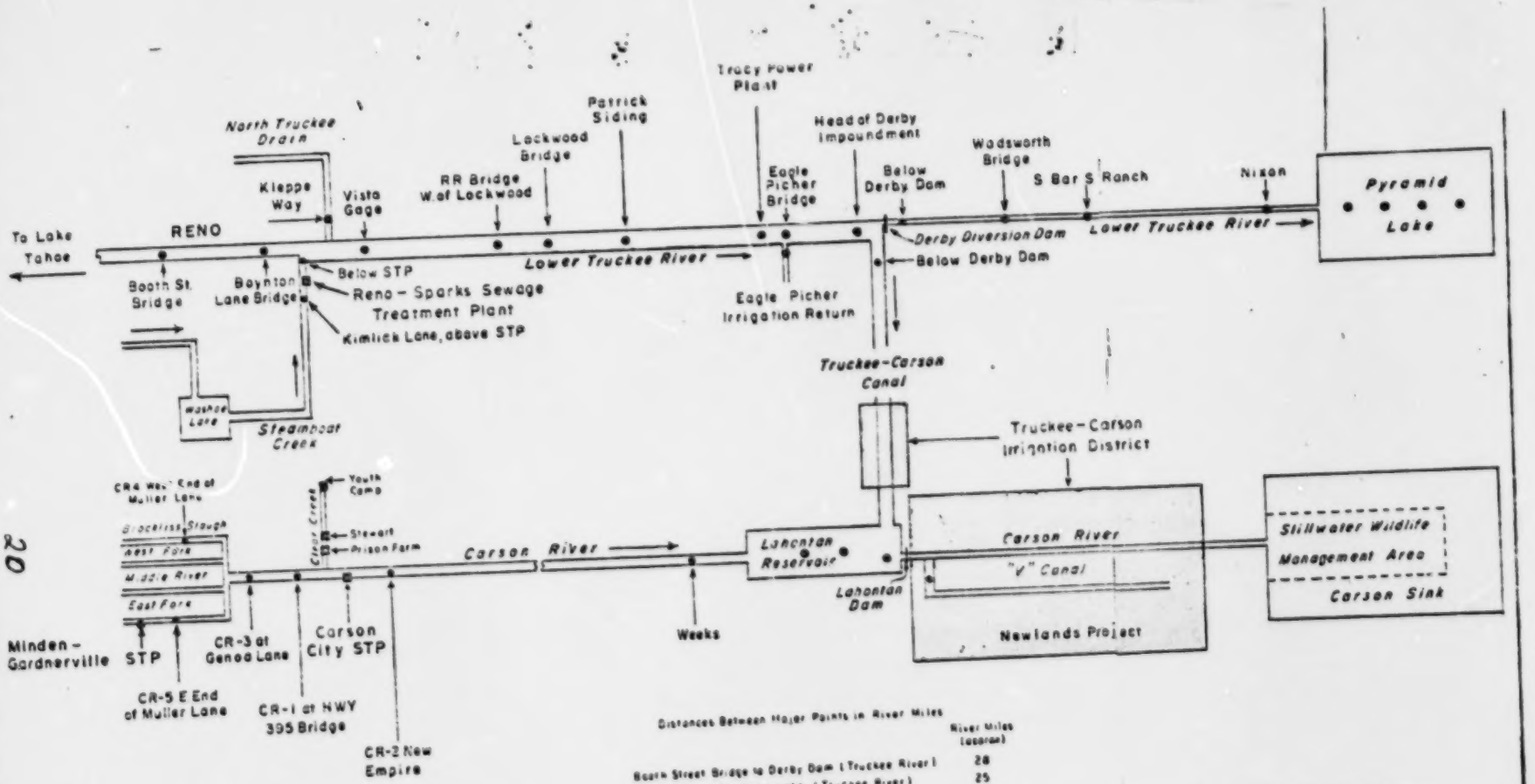

LEGEND

- Sampling Stations
- Waste Dischargers

Distances Between Major Points in River Miles

	River Miles (approx.)
Booth Street Bridge to Derby Dam (Truckee River)	28
Derby Dam to Pyramid Lake (Truckee River)	25
Derby Dam to Lahontan Dam (Truckee-Carson Canal	10
Muller Lane to Lahontan Reservoir (Carson River)	65
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BASIN CIRCULATION DIAGRAM

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20

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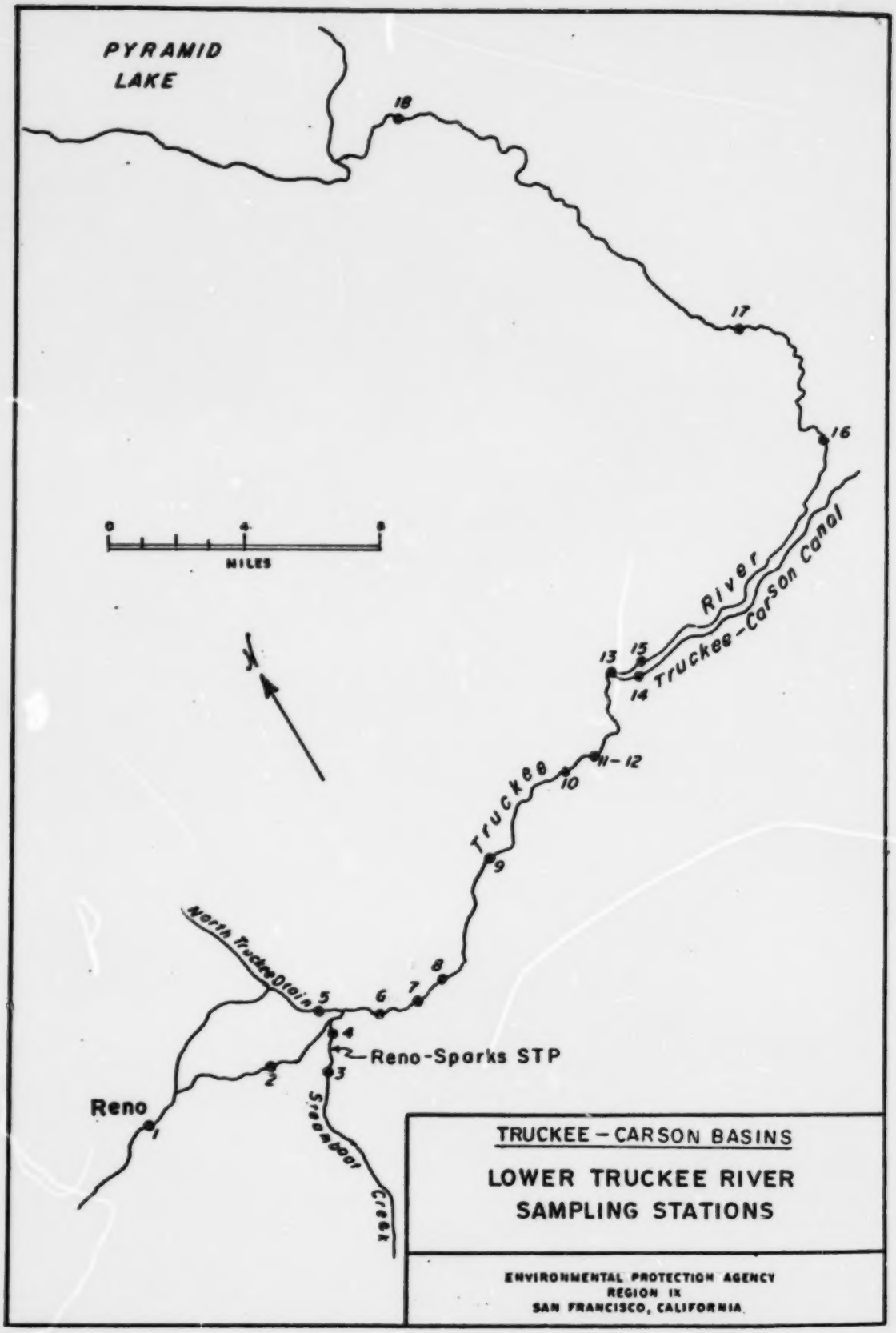
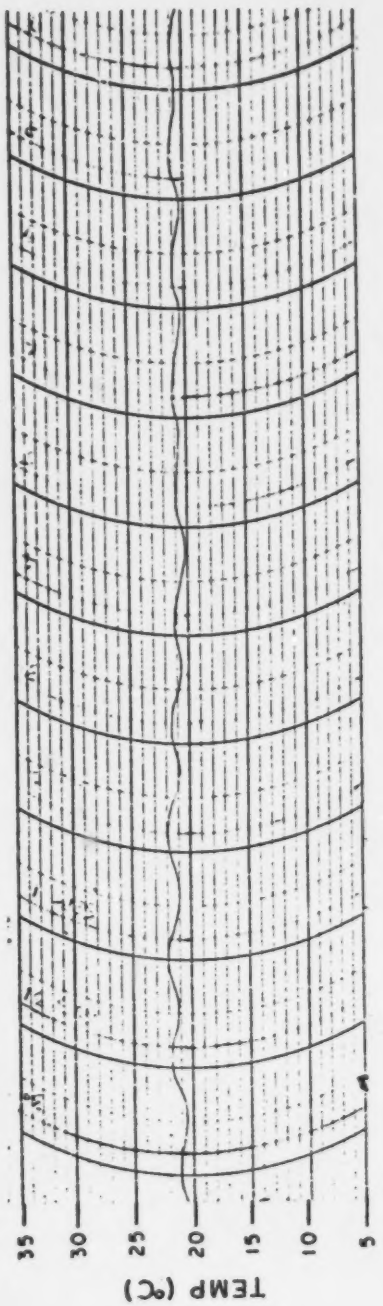
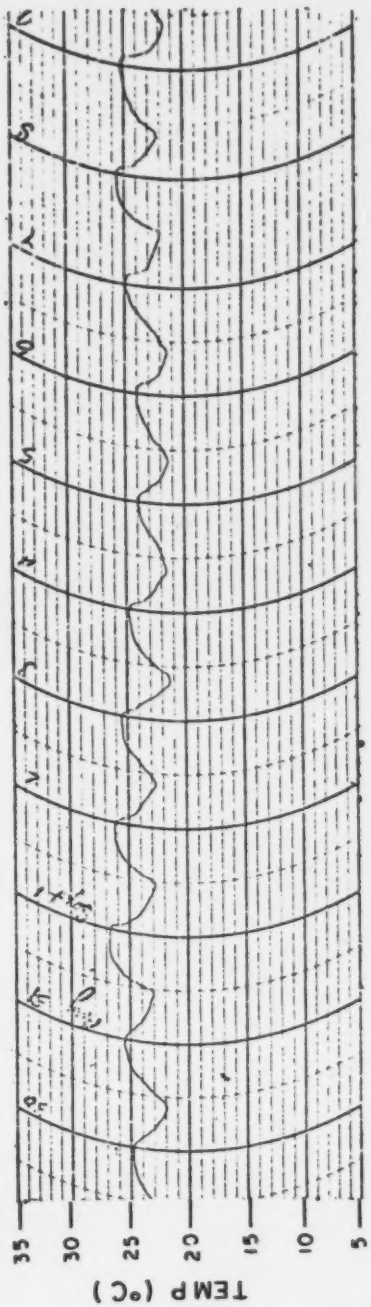

PYRAMID LAKE
18
17
16
0
4
8
MILES
River
Truckee-Carson Canal
13
15
14
11-12
10
Truckee
9
North Truckee Drain
5
6
7
8
4
Reno-Sparks STP
2
3
Reno
1
Steamboat Creek
TRUCKEE - CARSON BASINS
LOWER TRUCKEE RIVER
SAMPLING STATIONS
ENVIRONMENTAL PROTECTION AGENCY
REGION IX
SAN FRANCISCO, CALIFORNIA

FIGURE 3



a) Temperature record made 100 yards upstream from Tracy power plant. Thermograph located on river bottom at 5 foot depth.



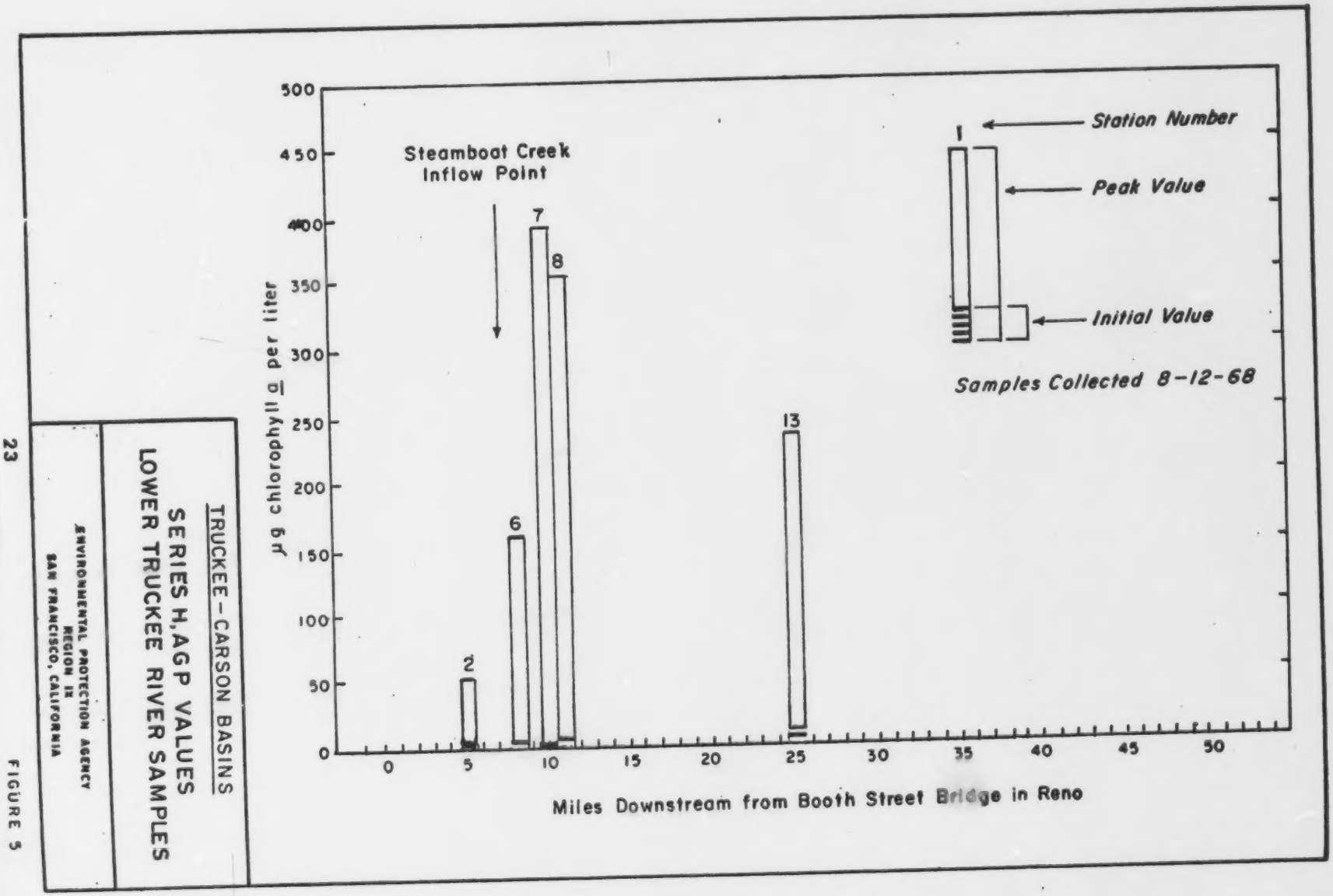
b) Temperature record made 100 yards downstream from Tracy power plant. Thermograph located on river bottom at 8 foot depth.

TRUCKEE – CARSON BASINS

TEMPERATURE TRACES
IN LOWER TRUCKEE RIVER
NEAR TRACY POWER PLANT

ENVIRONMENTAL PROTECTION AGENCY
REGION IX
SAN FRANCISCO, CALIFORNIA

FIGURE 4



TRUCKEE-CARSON BASINS

SERIES H,AGP VALUES

LOWER TRUCKEE RIVER SAMPLES

ENVIRONMENTAL PROTECTION AGENCY
REGION IX
SAN FRANCISCO, CALIFORNIA

FIGURE 5

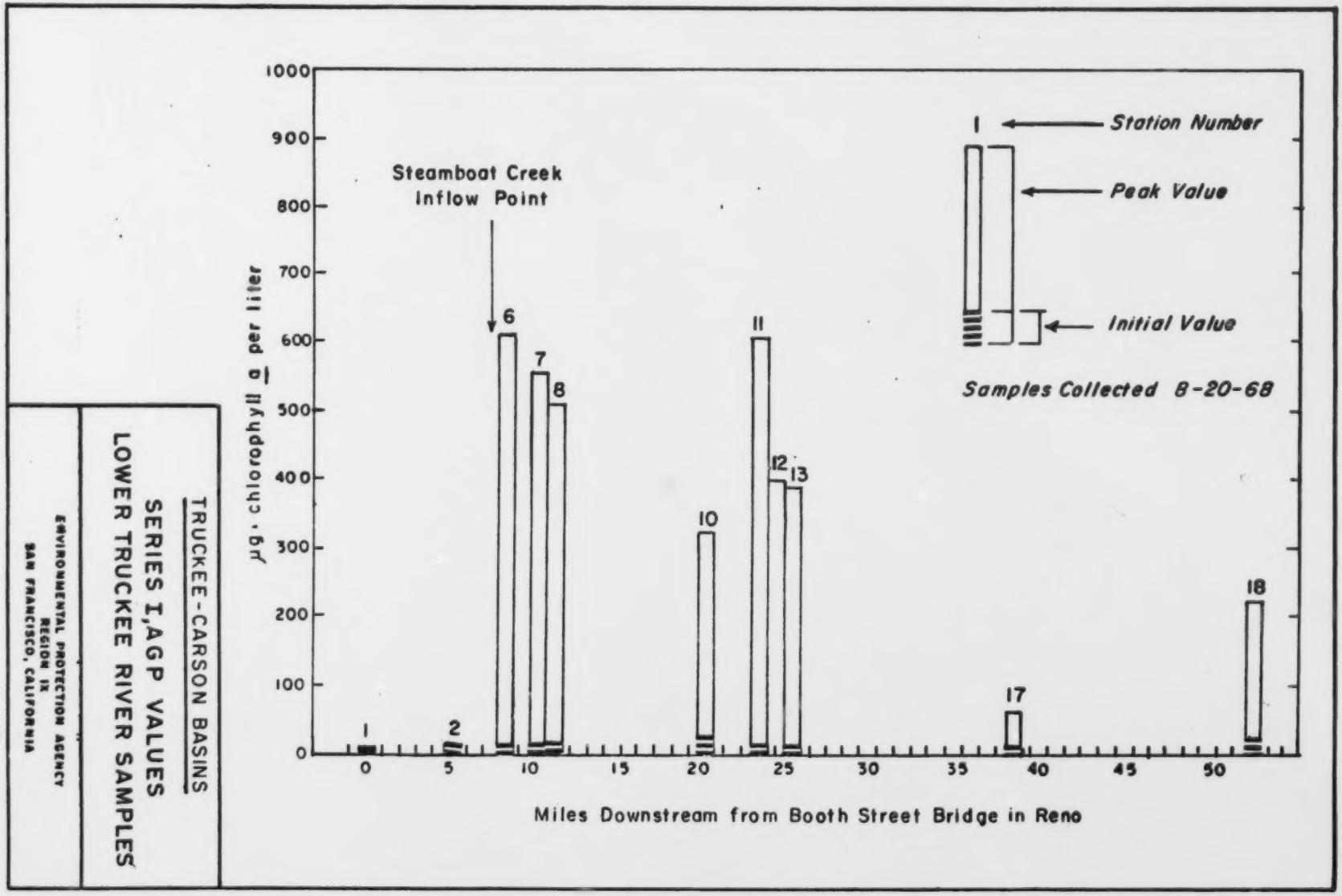
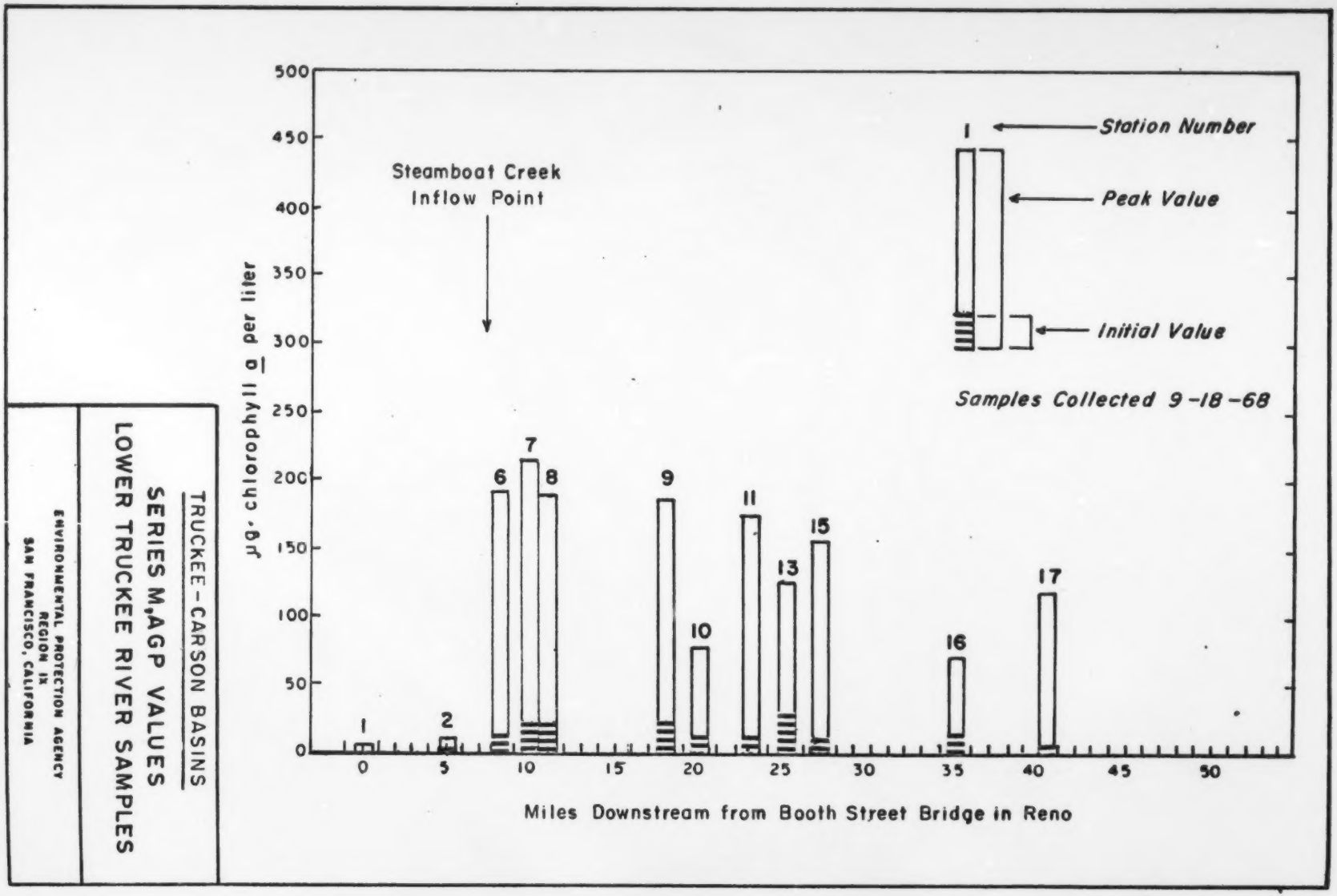

1000
900
800
700
600
500
400
300
200
100
0
mg. chlorophyll a per liter
Steamboat Creek
Inflow Point
1
2
6
7
8
10
11
12
13
17
18
1 Station Number
Peak Value
Initial Value
Samples Collected 8-20-68
0
5
10
15
20
25
30
35
40
45
50
Miles Downstream from Booth Street Bridge in Reno
TRUCKEE-CARSON BASINS
SERIES I, AGP VALUES
LOWER TRUCKEE RIVER SAMPLES
ENVIRONMENTAL PROTECTION AGENCY
REGION IX
SAN FRANCISCO, CALIFORNIA

FIGURE 6



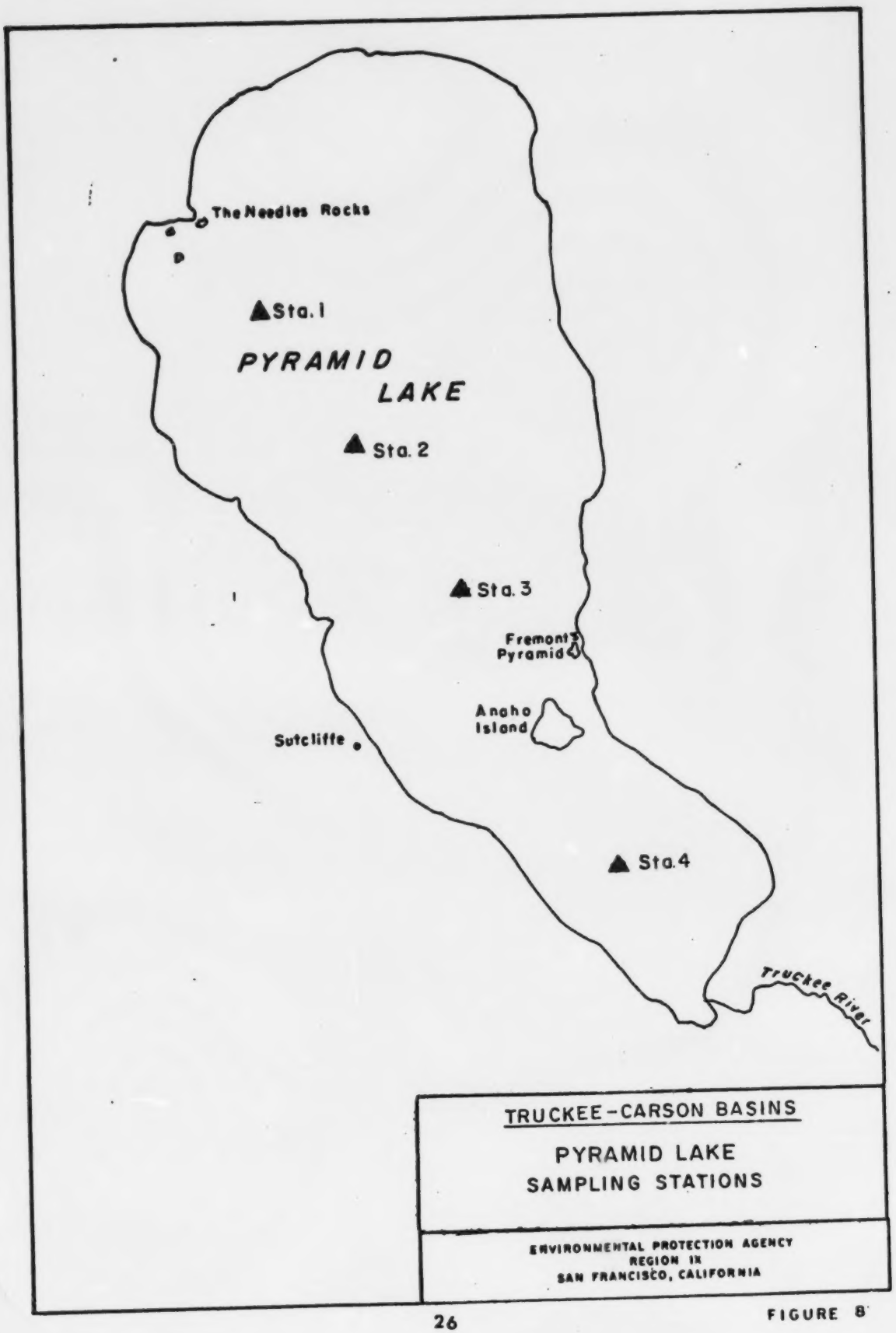
TRUCKEE-CARSON BASINS

SERIES M,AGP VALUES

LOWER TRUCKEE RIVER SAMPLES

ENVIRONMENTAL PROTECTION AGENCY
REGION IX
SAN FRANCISCO, CALIFORNIA

FIGURE 7

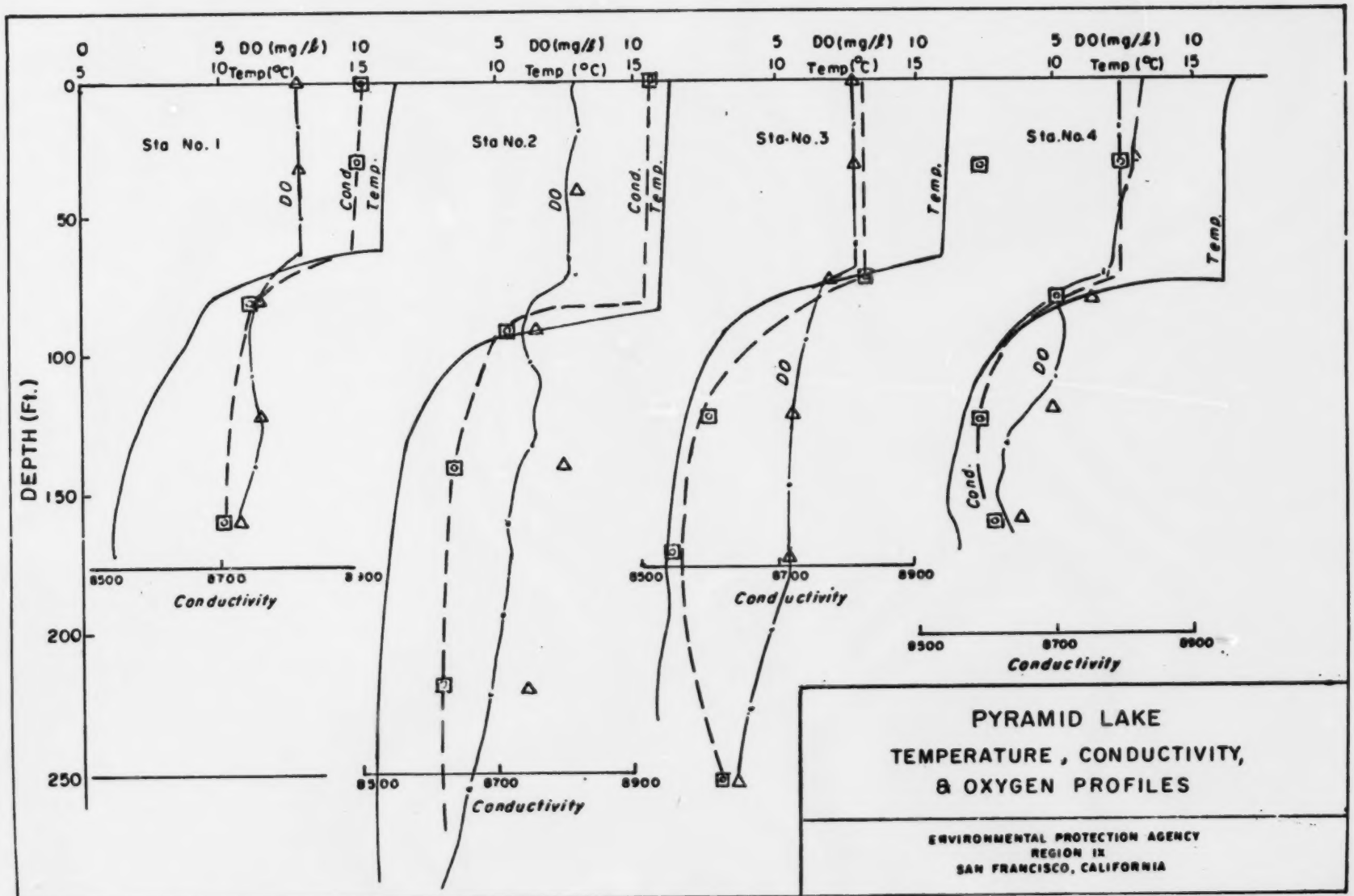


TRUCKEE-CARSON BASINS

PYRAMID LAKE
SAMPLING STATIONS

ENVIRONMENTAL PROTECTION AGENCY
REGION IX
SAN FRANCISCO, CALIFORNIA

FIGURE 8

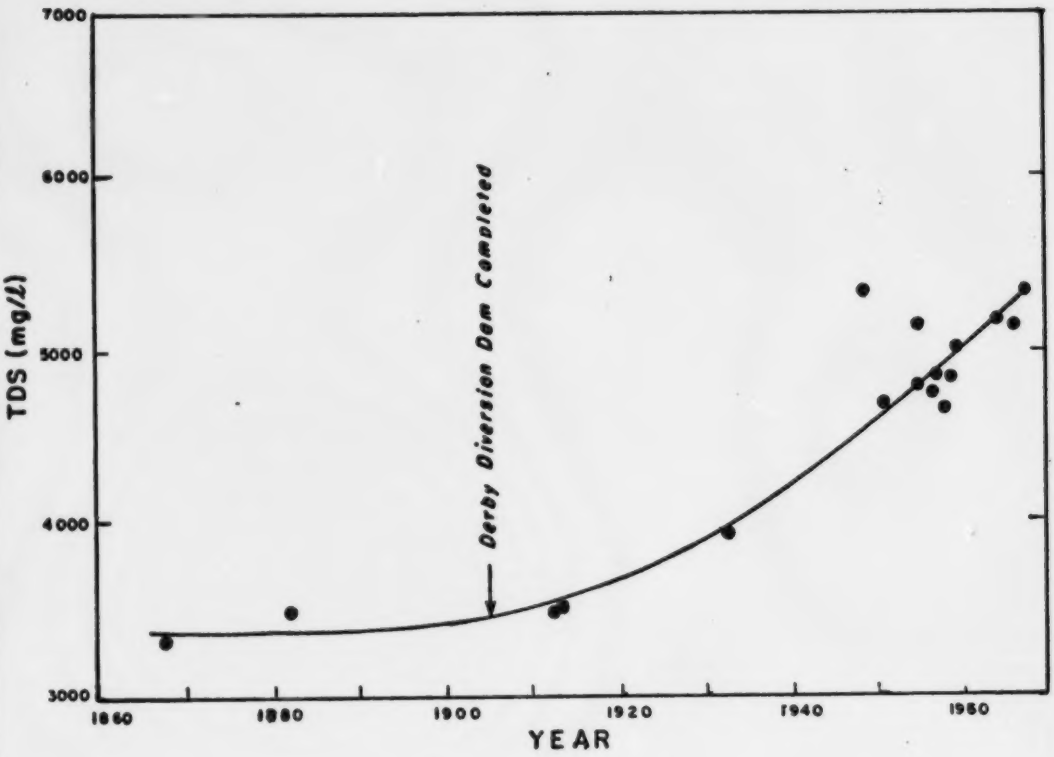


PYRAMID LAKE

TEMPERATURE, CONDUCTIVITY, & OXYGEN PROFILES

ENVIRONMENTAL PROTECTION AGENCY
REGION IX
SAN FRANCISCO, CALIFORNIA

FIGURE 9

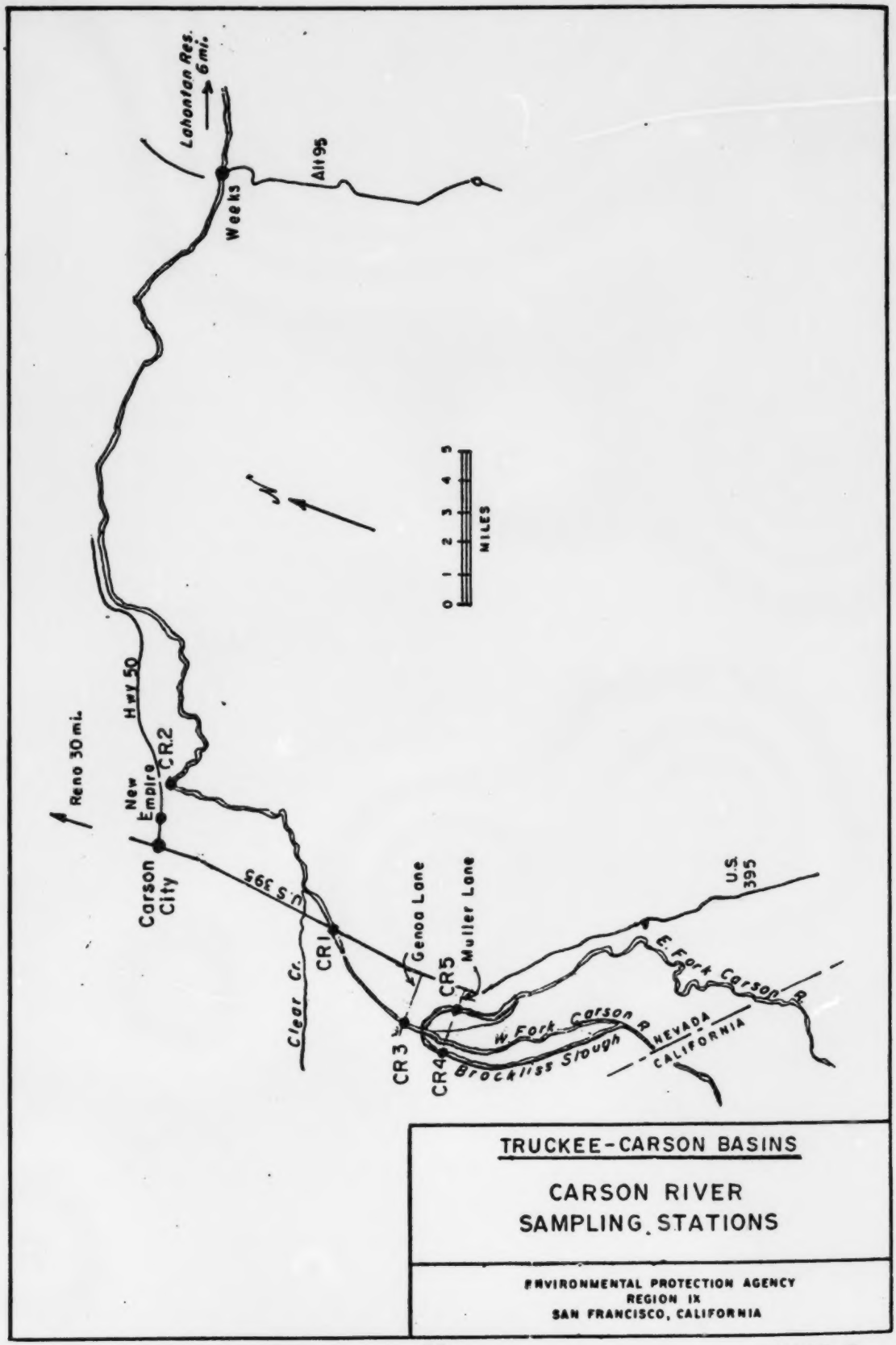


TRUCKEE – CARSON BASINS

HISTORIC TREND OF TDS
IN PYRAMID LAKE

ENVIRONMENTAL PROTECTION AGENCY
REGION IX
SAN FRANCISCO, CALIFORNIA

FIGURE 10



TRUCKEE-CARSON BASINS

CARSON RIVER
SAMPLING STATIONS

ENVIRONMENTAL PROTECTION AGENCY
REGION IX
SAN FRANCISCO, CALIFORNIA

FIGURE 11

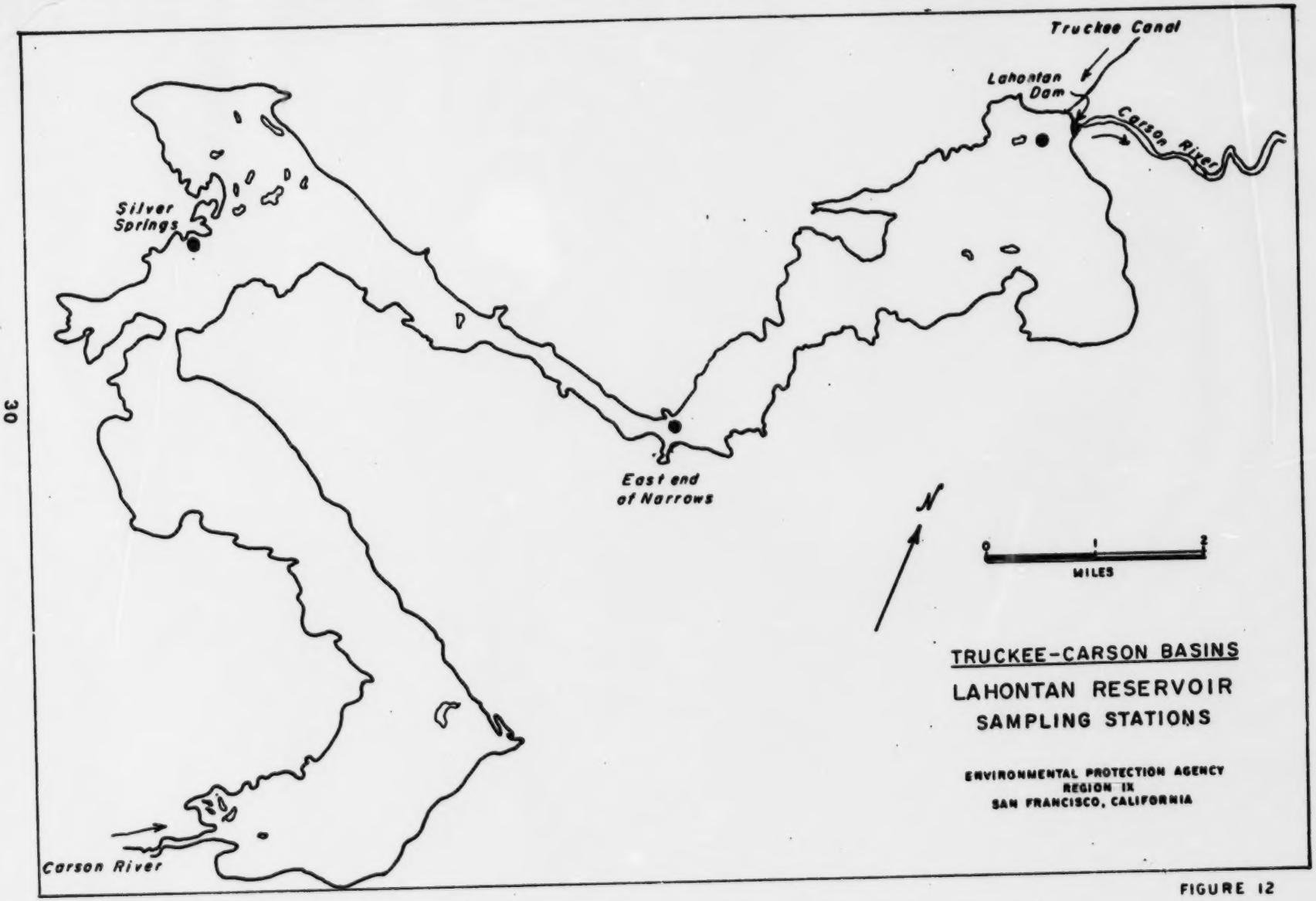

Truckee Canal
Lahontan Dam
Carson River
Silver Springs
East end of Narrows
N
0
1
2
MILES
TRUCKEE-CARSON BASINS
LAHONTAN RESERVOIR
SAMPLING STATIONS
ENVIRONMENTAL PROTECTION AGENCY
REGION IX
SAN FRANCISCO, CALIFORNIA
Carson River

FIGURE 12

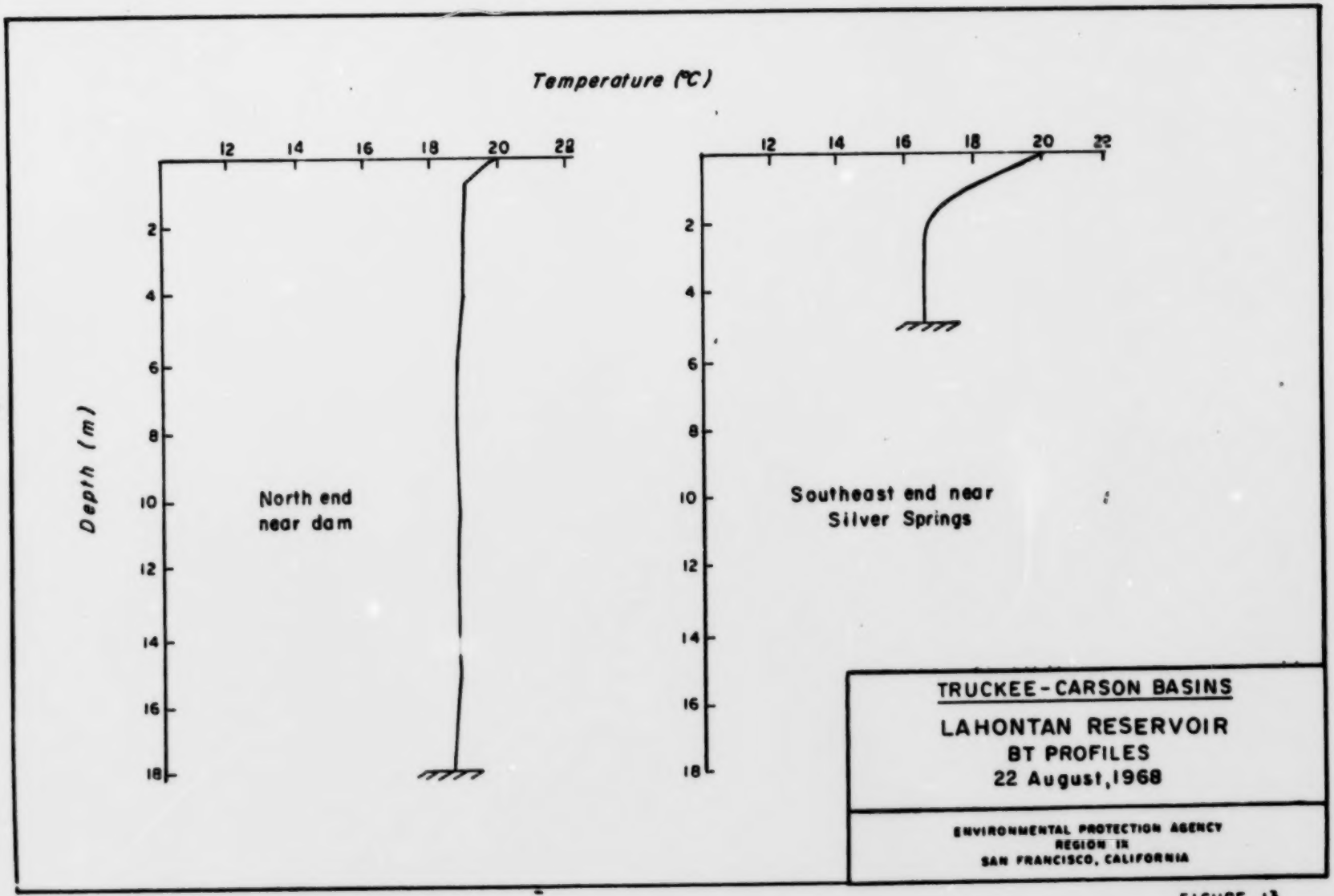

Temperature (°C)
12
14
16
18
20
22
Depth (m)
2
4
6
8
10
12
14
16
18
North end
near dam
Southeast end near
Silver Springs
TRUCKEE-CARSON BASINS
LAHONTAN RESERVOIR
BT PROFILES
22 August, 1968
ENVIRONMENTAL PROTECTION AGENCY
REGION IX
SAN FRANCISCO, CALIFORNIA

FIGURE 13

Table 1. - STREAM FLOW DATA FROM TRUCKEE AND CARSON RIVER SYSTEMS DURING 1968 WATER YEAR

Gaging Station	Mean Flow (cfs) 8-20	9-17	9-28	1968 Flow (cfs) Max.	Min.	Mean	Total (ac-ft)
Lower Truckee River							
Farad	582	518	504	1870	330	611	443,300
Reno	343	227	253	--	--	--	--
NTD*	--	--	75.8	--	--	--	--
SC** above WWTP***	--	--	90.8	--	--	--	--
SC below WWTP	--	--	116.8	--	--	--	--
WWTP discharge	--	--	26.5	--	--	--	--
Vista	441	328	376	2060	229	569	413,300
Below Derby Dam	63	40	33	1860	15	247	179,600
Wadsworth	81	62	45	2180	26	335	243,000
Nixon	82	70	56	2040	29	332	240,900
Truckee-Carson Canal							
Below Derby Dam	360	264	347	875	42	346	252,836
Near Wadsworth	392	301	337	900	0	250	181,196
Hazen	274	159	200	751	0	168	121,884
Carson River							
Near Ft. Churchill	0.6	0.9	0.6	1160	0.1	224	162,500
Near Fallon	634	652	515	1050	3.6	488	353,900

* North Truckee Drain at Kleppe Way
** Steamboat Creek
*** Reno-Sparks Waste Water Treatment Plant

Table 2. - WASTE DISCHARGES INTO TRUCKEE AND CARSON RIVERS

Discharges and Receiving Waters	Volume (mgd)	Treatment
Reno-Sparks WWTP Truckee River	14.4	Activated sludge, chlorination
Carson City WWTP Carson River	1.5	Primary treatment, oxidation lagoons
Minden-Gardnerville WWTP East Fork of Carson River	0.5	Extended aeration, final clarifier, chlorination
Job Corps Camp Clear Creek to Carson River	0.01-0.03	Extended aeration
Stewart Clear Creek to Carson River	0.09	Stabilization ponds
Prison Farm Clear Creek to Carson River	0.05	Lagoons

Table 3. - KEY TO LOWER TRUCKEE RIVER SAMPLING STATIONS SHOWN IN FIGURE 3

Station No.	Description	River Miles Below Mouth of Steamboat Creek
1	Booth Street Bridge in Reno	-8.0
1A	Glendale Bridge	-5.2
2	Boynton Lane Bridge in Reno	-2.9
2A	One mi. downstream from Univ. Exp. Farm	-1.8
3	Steamboat Creek at Kimlick Lane, 100 yards upstream from Reno-Sparks Waste Water Treatment Plant	--
4	Steamboat Creek, downstream from Reno-Sparks Waste Water Treatment Plant at confluence with Truckee River	--
5	North Truckee Drain at Kleppe Way, 1000 yards upstream from confluence with Truckee River	0.5
6	USGS Gaging Station at Vista	1.1
7	Railroad Bridge, one mile upstream from Vehicular Bridge at Lockwood	2.3
8	Vehicular Bridge at Lockwood	3.3
9	Railroad Siding at Patrick Ranch	8.6
10	Point 100 yards upstream from Tracy steam electric power plant	--
11	Vehicular Bridge at Eagle Picher Company	15.6
12	Irrigation return ditch near Eagle Picher Company	15.6
13	Head of Derby Impoundment	19.4

Table 3. - KEY TO LOWER TRUCKEE RIVER SAMPLING STATIONS SHOWN IN FIGURE 3 (Continued)

Station No.	Description	River Miles Below Mouth of Steamboat Creek
14	Truckee-Carson Canal, 100 yards downstream from Derby Dam	20.5
15	Truckee River, 100 yards downstream from Derby Dam	20.5
16	Vehicular Bridge at Wadsworth	29.5
17	S-Bar-S Ranch	33.5
18	Vehicular Bridge at Nixon	45.5

Table 4. - LOWER TRUCKEE RIVER FIELD MEASUREMENTS, AUGUST AND SEPTEMBER 1968

Date	Time	EC (μmhos/cm)	pH	Temp. (°C)	D.O. (mg/l)	Turb. (JTU)
Station 1 - Booth Street Bridge						
8-19	1545	118	--	13.0	9.2	--
	1950	120	7.50	15.5	8.2	7
	2330	120	7.70	14.0	8.0	11
8-20	0225	--	--	13.0	8.2	--
	0545	115	8.00	12.0	10.8	15
	0840	100	--	13.0	9.0	15
	1220	110	--	15.0	9.4	15
	1545	115	--	15.0	9.4	15
9-17	0650	100	7.80	13.0	8.8	--
	9045	110	7.95	13.0	9.8	--
	1220	110	8.40	15.6	10.0	--
	1700	110	8.70	19.0	9.0	--
Station 2 - Boynton Lane Bridge						
8-19	1630	118	--	14.0	9.0	--
	2010	130	8.20	15.5	7.6	11
	2350	120	7.50	14.0	7.3	20
8-20	0245	--	--	13.0	7.8	--
	0610	130	--	12.0	8.1	15
	0925	105	--	13.0	9.3	15
	1300	120	--	16.5	9.9	5
	1615	120	--	17.0	8.6	15
9-17	0720	120	7.85	13.0	8.2	--
	1015	130	7.90	13.0	10.4	--
	1330	130	8.40	17.0	11.2	--
	1735	120	8.90	18.0	9.6	--
	1930	150	8.40	18.0	7.6	--
	2130	115	8.00	17.0	6.8	--
	2330	120	7.60	16.0	7.0	--
9-18	0130	118	7.35	14.0	7.4	--
	0330	110	7.25	14.0	7.4	--
	0455	119	7.10	14.0	7.4	--
	0605	110	7.00	14.0	7.6	--

Table 4. - LOWER TRUCKEE RIVER FIELD MEASUREMENTS, AUGUST AND SEPTEMBER 1968 (Continued)

Date	Time	EC (µmhos/cm)	pH	Temp. (°C)	D.O. (mg/l)	Turb. (JTU)
Station 3 - Above Waste Water Treatment Plant on Steamboat Creek						
8-19	1650	360	--	15.5	8.2	--
	2035	400	7.80	13.0	--	48
8-20	0005	380	7.70	13.0	7.0	20
	0300	--	--	13.0	7.5	--
	0630	390	--	11.5	7.2	40
	0945	310	--	12.5	7.7	40
	1350	400	--	18.5	9.1	35
	1630	400	--	20.0	9.1	40
9-17	0745	300	7.95	13.0	7.4	--
	1030	330	7.80	13.0	8.6	--
	1340	330	8.40	19.0	9.8	--
	1755	270	8.25	22.0	8.2	--
Station 4 - Below Waste Water Treatment Plant on Steamboat Creek						
8-19	1705	420	--	15.5	7.8	--
	2100	380	7.50	15.5	7.6	40
8-20	0025	420	7.50	15.0	7.2	40
	0315	420	6.50	14.0	7.0	50
	0645	420	--	13.0	7.1	45
	0955	425	--	14.5	7.4	45
	1405	400	--	18.5	9.5	35
	1630	410	--	20.5	8.0	30
9-17	0755	420	7.80	13.0	7.2	--
	1045	410	7.80	15.6	8.0	--
	1355	370	7.85	21.0	8.4	--
	1830	490	7.85	22.0	8.2	--
Station 5 - North Truckee Drain at Kleppe Lane						
8-19	1730	360	--	14.0	7.8	--
	2135	270	7.40	13.0	6.5	80
8-20	0100	--	--	13.0	7.2	--
	0410	320	6.80	11.0	7.7	20
	0715	295	--	11.0	7.8	20
	1100	250	--	12.5	8.6	25
	1430	235	--	16.0	8.6	25

Table 4. - LOWER TRUCKEE RIVER FIELD MEASUREMENTS, AUGUST AND SEPTEMBER 1968 (Continued)

Date	Time	EC (µmhos/cm)	pH	Temp. (°C)	D.O. (mg/l)	Turb. (JTU)
Station 5 - Continued						
8-21	--	420	--	--	--	--
9-17	0825	300	7.80	12.0	7.8	--
	1110	300	7.85	14.0	9.2	--
	1455	300	8.50	19.5	10.2	--
Station 6 - Vista Gaging Station						
8-19	1800	240	--	14.0	8.0	--
	2200	220	7.50	13.0	7.6	23
8-20	0120	--	--	14.0	6.9	--
	0430	230	8.00	14.0	7.2	25
	0730	200	--	12.5	7.5	25
	1120	205	--	14.0	8.4	25
	1445	210	--	16.0	9.0	40
9-17	0845	230	6.50	12.0	7.4	--
	1125	240	7.90	14.0	8.7	--
	1525	270	8.15	19.5	10.4	--
	1955	270	6.20	19.5	8.4	--
	2220	260	8.20	18.0	7.2	--
9-18	0005	230	7.40	17.0	6.4	--
	0150	218	7.60	17.0	7.0	--
	0400	215	7.50	15.0	6.2	--
	0510	210	7.60	14.5	6.4	--
	0625	200	7.10	14.0	6.6	--
Station 7 - Railroad Bridge West of Lockwood						
8-19	1800	240	--	14.0	8.0	--
	2215	220	7.40	14.0	7.3	30
8-20	0135	--	--	14.0	6.9	--
	0500	225	8.00	13.0	7.1	20
	0745	225	--	12.5	7.4	25
	1130	200	--	14.5	8.0	20
	1500	220	--	16.0	8.7	25

Table 4. - LOWER TRUCKEE RIVER FIELD MEASUREMENTS, AUGUST AND SEPTEMBER 1968 (Continued)

Date	Time	EC (µmhos/cm)	pH	Temp. (°C)	D.O. (mg/l)	Turb. (JTU)
Station 7 - Continued						
9-17	0900	230	7.45	13.0	7.4	--
	1140	230	7.60	14.0	8.4	--
	1545	265	8.40	21.0	10.0	--
	2015	220	7.90	19.5	8.2	--
	2240	220	8.00	18.0	7.0	--
9-18	0025	210	7.70	18.0	6.6	--
	0200	225	7.60	17.0	7.0	--
	0410	220	7.60	16.0	6.0	--
	0525	220	7.40	15.0	6.2	--
	0630	215	7.20	15.0	6.4	--
Station 8 - Lockwood Bridge						
8-19	1830	240	--	14.0	7.6	--
	2230	230	7.50	14.0	7.4	25
8-20	0150	--	--	14.0	7.1	--
	0515	230	--	13.5	7.2	30
	0800	230	--	13.0	7.9	30
	1145	215	--	14.5	8.2	20
	1515	240	--	16.5	8.7	20
9-17	0915	240	7.60	13.0	8.4	--
	1150	240	7.75	14.5	9.3	--
	1605	265	8.10	18.0	8.6	--
	2035	235	--	18.0	7.0	--
	2255	220	7.80	18.0	6.6	--
9-18	0040	210	7.45	18.0	6.4	--
	0210	225	7.50	17.0	6.4	--
	0420	230	7.45	16.0	6.2	--
	0535	220	7.40	15.5	6.4	--
	0635	220	7.15	15.0	6.8	--
Station 9 - Patrick Siding						
9-18	0835	240	7.60	15.0	7.4	--
	1435	280	8.25	21.0	9.2	--
	1700	270	8.30	19.0	8.2	--
	2010	255	7.90	17.0	7.0	--
	2145	240	7.80	17.0	6.8	--

Table 4. - LOWER TRUCKEE RIVER FIELD MEASUREMENTS, AUGUST AND SEPTEMBER 1968 (Continued)

Date	Time	EC (µmhos/cm)	pH	Temp. (°C)	D.O. (mg/l)	Turb. (JTU)
Station 9 - Continued						
9-19	0055	265	7.40	16.0	6.4	--
	0225	260	7.40	16.0	6.4	--
	0430	265	7.45	15.5	6.6	--
	0550	265	7.40	15.0	6.4	--
Station 10 - Above Tracy Power Plant						
8-19	1620	--	6.90	19.0	9.2	--
8-20	0410	--	7.80	14.0	7.9	--
	0930	--	8.10	16.0	7.6	--
	1230	--	7.90	18.0	8.4	--
	1715	--	8.10	18.0	8.8	--
9-18	0900	262	8.30	19.0	8.0	--
	1455	280	8.90	21.0	8.6	--
	1715	270	8.90	20.5	8.4	--
	2035	265	8.90	19.5	7.8	--
	2205	255	8.90	19.0	7.6	--
9-19	0120	265	8.10	17.0	7.4	--
	0255	270	8.00	17.5	6.6	--
	0450	255	8.45	17.5	7.2	--
	0610	255	8.20	17.0	7.2	--
Station 11 - Eagle Picher Bridge						
8-19	1900	--	7.80	21.0	8.0	--
8-20	0425	--	7.80	14.0	7.4	--
	0910	--	7.80	16.0	7.6	--
	1300	--	7.60	19.0	8.2	--
	1700	--	7.40	19.0	8.2	--
9-18	0930	262	7.90	19.0	6.8	--
	1505	270	8.30	23.0	7.8	--
	1725	270	8.30	22.0	7.4	--
	2100	260	8.10	21.0	6.8	--
	2225	250	7.60	21.0	6.6	--

Table 4. - LOWER TRUCKEE RIVER FIELD MEASUREMENTS, AUGUST AND SEPTEMBER 1968 (Continued)

Date	Time	EC (µmhos/cm)	pH	Temp. (°C)	D.O. (mg/l)	Turb. (JTU)
Station 11 - Continued						
9-19	0135	250	7.40	19.0	6.5	--
	0310	250	7.50	18.0	6.5	--
	0505	260	6.90	17.0	6.8	--
	0625	245	7.35	17.0	6.6	--
Station 13 - Head of Derby Impoundment						
8-19	1700	--	7.80	18.0	7.9	--
8-20	0455	--	7.50	15.0	7.2	--
	0820	--	8.10	15.0	7.6	--
	1320	--	7.30	17.0	7.9	--
	1630	--	7.60	20.0	8.4	--
9-18	1000	268	7.80	18.5	6.8	--
	1525	260	8.10	23.0	7.6	--
	1740	260	8.35	22.5	8.0	--
	2120	260	8.10	21.0	7.0	--
	2320	260	7.75	20.5	6.6	--
9-19	0155	250	7.60	20.0	6.4	--
	0400	250	7.70	19.5	6.4	--
	0525	250	7.60	18.5	6.4	--
	0645	250	7.40	17.0	6.4	--
Station 14 - Truckee-Carson Canal Below Derby Dam						
8-19	1710	--	7.20	17.0	7.4	--
8-20	0505	--	7.50	16.0	7.2	--
	0840	--	7.70	15.0	7.8	--
	1330	--	7.20	16.0	8.0	--
	1645	--	7.30	19.0	8.2	--
9-18	1030	260	7.90	19.5	7.0	--
	1535	270	8.10	21.0	7.4	--
Station 15 - Truckee River Below Derby Dam						
9-18	1105	268	8.25	20.5	8.6	--
	1540	280	8.40	21.0	8.0	--

Table 4. - LOWER TRUCKEE RIVER FIELD MEASUREMENTS, AUGUST AND SEPTEMBER 1968 (Continued)

Date	Time	EC (µmhos/cm)	pH	Temp. (°C)	D.O. (mg/l)	Turb. (JTU)
Station 16 - Wadsworth Bridge						
9-18	1220	335	8.20	19.5	10.2	--
	1630	340	8.50	21.0	9.6	--
Station 17 - S-Bar-S Ranch						
8-19	1815	--	8.60	21.0	13.0	--
8-20	0540	--	7.80	16.0	6.0	--
	0740	--	7.80	15.0	6.8	--
	1400	--	8.30	21.0	15.0	--
	1600	--	8.40	21.0	15.0	--
9-18	1150	440	8.50	20.0	10.2	--
Station 18 - Nixon						
8-20	0625	--	7.90	14.0	7.8	--
	1500	--	7.80	21.0	10.4	--

Table 5. - RESPIRATION RATES BASED ON LIGHT-DARK BOTTLE EXPERIMENTS IN LOWER TRUCKEE RIVER, AUGUST 20, 1968

Station	Time	Initial D.O. (mg/l)	Respiration rate (mg/l/hr)	Duration of resp. test (hrs)
#1 - Booth St. Br.	1415	9.1	0.002	4.5
#2 - Boynton Br.	1415	10.1	0.002	4.5
#6 - Vista Gaging Station	1415	9.1	0.00	4.5

Table 6. - BENTHIC ALGAL PHOTOSYNTHETIC AND RESPIRATION RATES ON TRUCKEE RIVER

Station	Gross Production 1963 gm m^{-2} day	Gross Production 1968 gm m^{-2} day	Respiration 1963 gm m^{-2} day	Respiration 1968 gm m^{-2} day	Peak Activity 1963 gm m^{-2} day	Peak Activity 1968 gm m^{-2} day
#1A - Glendale Br.	8.4	2.0	11.3	4.2	.6	.2
#2A - 1 mi. downstream from Univ. Exp. Farm	16.9	.2	23.9	.9	.9	.02
#3 - 100 meters upstream from Steamboat Cr.	4.0	-	13.2	-	-	-
#6 - Vista	-	0	-	1.9	-	0
#8 - Lockwood	-	.24	-	2.3	-	.09
#17 - S-Bar-S Ranch	-	2.4	-	0.8	-	.2

Table 7. - LABORATORY MEASUREMENTS FROM LOWER TRUCKEE RIVER SAMPLES, AUGUST AND SEPTEMBER, 1968

Station	#1 Booth St. Bridge		#2 Boynton Ln. Bridge		#3 Ab. WWTP on Steamboat Cr.		#4 Below WWTP on Steamboat Cr.		#5 No. Truckee Dr. At Kleppe Lane	
Date	8-20	9-17	8-20	9-17	8-20	9-17	8-20	9-17	8-20	9-17
Time	1830	1700	2030	1735	2100	1755	2115	1830	1910	1455
EC (μmhos/cm)	100	110	112	120	365	300	395	375	215	325
TDS (mg/l)	90	75	85	90	285	200	280	--	180	205
Total P (mg/l)	.03	.06	.03	.05	.285	.285	2.65	--	.105	.145
Ortho P (mg/l)	.017	.023	.02	.037	.197	.193	$\leq$ 2	--	.06	.110
NH_3-N (mg/l)	.12	.20	<.05	.24	.21	.33	4.5	6.0	.17	.22
Org-N (mg/l)	.34	.16	.14	.21	.4	.46	35.5	36.0	.68	.34
NO_3-N (mg/l)	<.02	.02	.03	.03	.12	.33	.09	.13	.03	.25
Hardness (mg/l)	14.5	15.5	17.5	17.5	36.5	33.0	35.5	36.0	24.0	40.0
Na (mg/l)	5.6	5.8	17.5	6.8	42.0	26.0	44.0	36.0	24.0	24.0
K (mg/l)	1.7	1.5	3.5	1.7	7.1	5.3	7.6	6.8	3.5	3.2
B (mg/l)	.11	<.10	.12	<.10	1.6	3.4	1.3	3.3	.15	.13
SS_I (ml/l)*	.08	--	.12	--	.40	--	.40	--	.20	--
Temp (°C)	--	19	--	18	--	22	--	21	--	19

* Settleable solids (Imhoff cone).

Table 7. - LABORATORY MEASUREMENTS FROM LOWER TRUCKEE RIVER SAMPLES, AUGUST AND SEPTEMBER, 1968 (Continued)

Station	#6 Vista Gaging Station		#7 R.R. Br. west of Lockwood		#8 Lockwood Br.		#9 Patrick Siding
Date	8-20	9-17	8-20	9-17	8-20	9-17	9-18
Time	1930	1525	1945	1545	2000	1605	0835
EC (μmhos/cm)	200	240	195	245	200	265	240
TDS (mg/l)	160	160	160	155	160	155	170
Total P (mg/l)	.535	.625	.465	.715	.465	.77	.850
Ortho P (mg/l)	.433	.607	.367	.673	.37	.77	.817
NH_3-N (mg/l)	.65	.98	.70	1.3	.68	.91	.83
Org-N (mg/l)	.45	.44	.26	1.0	.40	.49	.36
NO_3-N (mg/l)	<.02	.23	.16	.21	.21	.39	.67
Hardness (mg/l)	24.5	28.0	24.5	28.0	24.5	29.5	30.0
Na (mg/l)	17	18	17.5	18.5	6.5	18	20
K (mg/l)	3.3	3.3	3.5	3.6	3.4	3.6	3.9
B (mg/l)	.32	.32	.33	.35	.35	.38	.35
SS_I (ml/l)	.12	--	.20	--	.20	--	--
Temp (°C)	--	19	--	21	--	18	15

Table 7. - LABORATORY MEASUREMENTS FROM LOWER TRUCKEE RIVER SAMPLES, AUGUST AND SEPTEMBER, 1968 (Continued)

Station	#10 Above Tracy Power Plant		#11 Eagle Picher Bridge		#13 Head of Derby Impoundment		#14 Truckee-Carson Canal Below Derby Dam
Date	8-20	9-18	8-20	9-18	8-20	9-18	9-18
Time	1230	0900	1300	0930	1320	1000	1030
EC (μmhos/cm)	225	260	225	260	225	270	260
TDS (mg/l)	165	170	160	150	160	155	145
Total P (mg/l)	.565	.635	.605	.655	.615	.645	.730
Ortho P (mg/l)	.533	.604	.557	.590	.557	.603	.640
NH_3-N (mg/l)	.33	.46	.33	.50	.40	.41	.37
Org-N (mg/l)	.48	.37	1.1	.44	.41	.32	.31
NO_3-N (mg/l)	.36	.41	.50	.57	.51	.60	.62
Hardness (mg/l)	27.5	29.5	27.0	29.5	27.5	30.0	29.5
Na (mg/l)	19	18	19.5	18	19	19.5	20
K (mg/l)	3.6	3.8	3.7	3.8	3.7	3.7	3.6
B (mg/l)	.31	.50	.30	.61	.34	.34	.44
SS_I (ml/l)	.08	--	.20	--	.10	--	--
Temp (°C)	--	19	--	19	--	18.5	19.5

Table 7. - LABORATORY MEASUREMENTS FROM LOWER TRUCKEE RIVER SAMPLES, AUGUST AND SEPTEMBER, 1968 (Continued)

Station	#15 Below Derby Dam		#16 Wadsworth Bridge	#17 S-Bar-S Ranch		#18 Nixon
Date	8-20	9-18	9-18	8-20	9-18	8-20
Time	1340	1105	1220	1400	1150	1500
EC (μmhos/cm)	220	270	335	330	440	475
TDS (mg/l)	160	155	195	250	265	325
Total P (mg/l)	.510	.715	.340	.270	.325	.240
Ortho P (mg/l)	.487	.603	.327	.213	.243	.160
NH_3-N (mg/l)	.49	.17	.23	.20	.15	.10
Org-N (mg/l)	.45	.69	.30	.54	.30	.97
NO_3-N (mg/l)	.58	.52	.34	.07	.38	.05
Hardness (mg/l)	27.5	30.5	38.5	47.5	53.0	57.5
Na (mg/l)	18.5	19.5	25.0	58.0	34.0	49.0
K (mg/l)	3.7	3.6	4.2	4.5	4.6	1.9
B (mg/l)	.33	.44	.42	.41	.50	.54
SS_I (ml/l)	.1	--	--	.10	--	.01
Temp (°C)	--	20.5	19.5	--	20.0	--

Table 8. - COLIFORM MEASUREMENTS FROM LOWER TRUCKEE RIVER, AUGUST AND SEPTEMBER 1968

#1 Booth Street Bridge

Date	Time	(Coliform/100 ml) Total	Fecal
8-19	pm	TNTC*	36
8-20	am	137	8
	pm	280	66
8-21	am	690	250
	pm	60	84
8-22	am	738	176
	pm	110	86
8-23	am	640	130
	pm	30	15
9-16	pm	80	30
9-17	am	300	20
	pm	150	20
9-18	am	1300	300
	pm	300	80
9-19	am	1100	125
	pm	100	82

#2 Boynton Lane Bridge

Date	Time	(Coliform/100 ml) Total	Fecal
8-19	pm	TNTC	43
8-20	am	123	9
	pm	190	6
8-21	am	600	78
	pm	430	126
8-22	am	279	144
	pm	110	40
8-23	am	390	220
	pm	140	15
9-16	pm	300	75
9-17	am	50	100
	pm	70	70
9-18	am	1200	170
	pm	500	150
9-19	am	1800	190
	pm	400	65

* Too numerous to count.

Table 8. - COLIFORM MEASUREMENTS FROM LOWER TRUCKEE RIVER, AUGUST AND SEPTEMBER 1968 (Continued)

#6 Vista Gaging Station

Date	Time	(Coliform/100 ml) Total	Fecal
8-19	pm	640	18
8-20	am	180	4
	pm	640	8
8-21	am	1480	262
	pm	440	80
8-22	am	1080	488
	pm	480	532
8-23	am	1330	305
	pm	560	235
9-16	pm	200	125
9-17	am	TNTC*	0
	pm	TNTC	50
9-18	am	7800	250
	pm	5500	275
9-19	am	5400	400
	pm	1200	125

* Too numerous to count.

#8 Lockwood Bridge

Date	Time	(Coliform/100 ml) Total	Fecal
8-19	pm	TNTC	3
8-20	am	120	5
	pm	420	8
8-21	am	520	380
	pm	410	64
8-22	am	774	400
	pm	110	468
8-23	am	450	300
	pm	460	260
9-16	pm	TNTC	84
9-17	am	TNTC	100
	pm	150	125
9-18	am	2000	300
	pm	2500	170
9-19	am	3000	150
	pm	900	150

Table 8. - COLIFORM MEASUREMENTS FROM LOWER TRUCKEE RIVER, AUGUST AND SEPTEMBER 1968 (Continued)

#11 Eagle Picher Bridge

Date	Time	(Coliform/100 ml) Total	Fecal
8-19	pm	TNTC*	12
8-20	am	86	6
	pm	420	0
8-21	am	270	160
	pm	280	92
8-22	am	603	120
	pm	300	112
8-23	am	230	140
	pm	240	125
9-16	pm	TNTC	150
9-17	am	TNTC	250
	pm	TNTC	80
9-18	am	860	60
	pm	400	100
9-19	am	900	75
	pm	700	75

* Too numerous to count.

#17 S-Bar-S Ranch

Date	Time	(Coliform/100 ml) Total	Fecal
8-19	pm	TNTC	10
8-20	am	45	4
	pm	280	0
8-21	am	520	134
	pm	170	40
8-22	am	360	56
	pm	140	120
8-23	am	810	90
	pm	160	105
9-16	pm	250	60
9-17	am	TNTC	0
	pm	100	100
9-18	am	900	200
	pm	700	70
9-19	am	900	100
	pm	broken	60

Table 9. - CHLOROPHYLL a MEASUREMENTS AND ALGAL GROWTH POTENTIAL IN LOWER TRUCKEE RIVER, AUGUST AND SEPTEMBER 1968

Sampling Station		Series	Chlorophyll a (In situ) Date	Chlorophyll a (In situ) µg/l	AGP Chlorophyll a (Initial) Date	AGP Chlorophyll a (Initial) µg/l	AGP Chlorophyll a (Peak) Date	AGP Chlorophyll a (Peak) µg/l
#1	Booth St. Bridge (Truckee River)	H	-	-	-	-	-	-
		I	8/20	5	8/30	2	8/22	5
		M	9/17	3	10/2	<1	9/25	8
#2	Boynton Ln. Bridge (Truckee River)	H	8/12	-	8/16	4	8/21	54
		I	8/20	8	9/5	3	8/22	9
		M	9/17	3	10/2	3	9/25	12
#3	Kimlick Lane above WWTP (Steamboat Creek)	H	-	-	-	-	-	-
		I	8/20	9	8/22	17	9/5	82
		M	9/17	-	10/2	9	9/25	27
#4	Below WWTP (Steamboat Creek)	H	-	-	-	-	-	-
		I	8/20	7	8/22	9	8/28	684
		M	9/17	-	9/23	13	10/1	660
#5	Kleppe Way (North Truckee Drain)	H	8/12	-	8/16	10	8/21	166
		I	8/20	7	8/23	6	9/5	38
		M	9/17	5	10/4	10	9/25	77
#6	Vista Gaging Stn. (Truckee River)	H	8/12	-	8/16	6	8/23	160
		I	8/20	6	8/23	7	9/3	306
		M	9/17	4	10/4	14	9/27	191
#7	Railroad Bridge west of Lockwood (Truckee River)	H	8/12	-	8/16	5	8/21	392
		I	8/20	5	8/22	7	9/5	280
		M	9/17	4	9/23	26	9/25	218
#8	Lockwood Bridge (Truckee River)	H	8/12	-	8/16	6	8/21	355
		I	8/20	6	8/22	9	9/5	286
		M	9/17	5	10/4	24	9/27	191
#9	Patrick Siding (Truckee River)	H	-	-	-	-	-	-
		I	-	-	-	-	-	-
		M	9/18	-	10/4	25	9/27	188

Table 9. - CHLOROPHYLL a MEASUREMENTS AND ALGAL GROWTH POTENTIAL IN LOWER TRUCKEE RIVER, AUGUST AND SEPTEMBER 1968 (Continued)

Sampling Station		Series	Chlorophyll a (In situ) Date	Chlorophyll a (In situ) µg/l	AGP Chlorophyll a (Initial) Date	AGP Chlorophyll a (Initial) µg/l	AGP Chlorophyll a (Peak) Date	AGP Chlorophyll a (Peak) µg/l
#10	Above Tracy Power Plant (Truckee River)	H	-	-	-	-	-	-
		I	8/20	18	8/22	13	9/5	163
		M	9/18	15	10/2	12	9/27	80
#11	Eagle Picher Br. (Truckee River)	H	-	-	-	-	-	-
		I	8/20	-	8/22	10	9/5	304
		M	9/18	15	10/4	13	9/27	176
#12	Irrigation Return at Eagle Picher Br. (Truckee River)	H	-	-	-	-	-	-
		I	8/20	-	8/23	2	9/5	200
		M	-	-	-	-	-	-
#13	Head of Derby Impoundment (Truckee River)	H	8/13	-	8/16	8	8/21	232
		I	8/20	-	8/22	8	9/5	195
		M	9/18	9	10/2	30	10/4	127
#14	Below Derby Dam (Truckee-Carson Canal)	H	-	-	-	-	-	-
		I	8/20	7	8/22	7	9/5	238
		M	9/18	10	10/4	12	9/25	193
#15	Below Derby Dam (Truckee River)	H	-	-	-	-	-	-
		I	-	-	-	-	-	-
		M	9/18	5	10/4	8	9/25	161
#16	Wadsworth Bridge (Truckee River)	H	-	-	-	-	-	-
		I	-	-	-	-	-	-
		M	9/18	12	10/1	15	9/23	71
#17	S-Bar-S Ranch (Truckee River)	H	-	-	-	-	-	-
		I	8/20	-	8/28	10	9/3	31
		M	9/18	35	10/4	7	9/23	121
#18	Nixon (Truckee River)	H	-	-	-	-	-	-
		I	8/20	-	8/28	12	9/5	112
		M	-	-	-	-	-	-

Table 10. - WATER QUALITY STANDARDS FOR TRUCKEE RIVER CONTROL POINTS*

	Idlewild (near Booth St.)	Boynton Ln.	Lagomarsino (Lockwood Br.)	Ceresola Ranch (Wadsworth)
Temp. (°C)				
June-Sept avg. not more than	17	17	17	18
summer not more than	21	22	22	25
winter not more than	14	14	14	14
pH units				
annual median within range	7.5-8.0	7.5-8.0	7.4-7.9	7.5-8.3
single value within range	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
D.O. (mg/l)				
June-Sept avg. not less than	8.0	7.5	6.5	6.5
single value not less than	7.0	7.0	6.0	6.0
BOD (mg/l)				
single value not more than	5	10	10	10
Chlorides (mg/l)				
single value not more than	10	10	10	25
PO_4 (mg/l)				
annual average not more than	0.1	0.25	0.5	0.75
single value not more than	0.3	0.40	0.6	1.00
NO_3 (mg/l)				
single value not more than	2.0	2.0	5.0	5.0
TDS (mg/l)				
annual average not more than	100	125	150	250
single value not more than	125	150	175	300

* From State of Nevada Water Pollution Control Regulations, amended July 1, 1967.

Table 11. - BENTHIC INVERTEBRATES OF LOWER TRUCKEE RIVER:
PERCENT OCCURRENCE OF DOMINANT BENTHIC ANIMALS

	#1 Booth St. Bridge 8/21	Booth St. Bridge 9/17	#2 Boynton Lane Br. 8/21	Boynton Lane Br. 9/17	#6 Vista Gage 8/21	#8 Lockwood Bridge 8/21
Turbellaria (Flatworms)						
Planariidae	.8	1.0	.6	1.3	--	6.6
Oligochaeta (Roundworms)	.2	--	.1	1.2	5.9	12.0
Amphipoda (Amphipods)						
Gammaridae						
Crangonyx	--	--	--	--	--	1.3
Ephemeroptera (Mayflies)						
Baetidae						
Baetis	48.0	39.8	37.5	43.1	1.2	15.8
Trichoptera (Caddisflies)						
Hydropsychidae						
Hydropsyche	14.2	22.8	42.5	32.9	1.2	47.0
Cheumatopsyche	12.7	8.4	10.1	8.5	--	.2
Diptera (True Flies)						
Chironomidae (True Midges)						
Orthocladiinae						
Cardiocladius	10.7	12.0	2.7	4.2	--	4.1
Cricotopus	1.4	.3	1.1	2.4	63.4	1.5
Chironominae						
Cladotanytarsus	.1	--	--	--	--	--
Dicrotendipes	--	--	--	--	3.5	--
Polypedilum	.8	--	.4	.4	2.4	--
Tanytarsus	--	--	--	--	14.1	--
Gastropoda (Snails)						
Physidae						
Physa	--	--	--	--	--	--
Total Percent of Sample	88.9	84.5	95.0	94.0	91.7	88.5

Table 11. - BENTHIC INVERTEBRATES OF LOWER TRUCKEE RIVER:
PERCENT OCCURRENCE OF DOMINANT BENTHIC ANIMALS (Continued)

	#9 Patrick Siding 9/17	#10 Above Tracy P.P. 9/17	Below Tracy 9/17	#13 Derby Impndmt 9/17	#14 Below Derby 9/17	#17 S-Bar-S 9/18
Turbellaria (Flatworms)						
Planariidae	2.9	2.8	--	.6	16.6	43.4
Oligochaeta (Roundworms)	--	4.0	--	6.5	3.2	13.0
Amphipoda (Amphipods)						
Gammaridae						
Crangonyx	.9	9.5	--	--	--	1.9
Ephemeroptera (Mayflies)						
Baetidae						
Baetis	20.0	59.5	8.8	.9	15.0	5.9
Trichoptera (Caddisflies)						
Hydropsychidae						
Hydropsyche	69.1	14.6	3.8	2.8	46.9	3.5
Cheumatopsyche	--	--	--	--	--	--
Diptera (True Flies)						
Chironomidae (True Midges)						
Orthocladiinae						
Cardiocladius	1.6	2.0	2.6	--	2.0	--
Cricotopus	3.3	2.2	75.7	12.0	2.0	15.9
Chironominae						
Cladotanytarsus	--	--	--	26.3	--	--
Dicrotendipes	--	--	--	37.0	--	--
Polypedilum	--	1.2	1.5	7.7	9.1	.1
Tanytarsus	--	--	1.1	--	--	3.2
Gastropoda (Snails)						
Physidae						
Physa	--	--	--	--	--	6.5
Total Percent of Sample	97.8	95.8	93.5	93.8	94.8	93.4

Table 12. - BENTHIC INVERTEBRATES OF LOWER TRUCKEE RIVER: PERCENT OCCURRENCE BY MAJOR TAXONOMIC GROUP

RENO-PYRAMID LAKE, AUGUST 21 - SEPTEMBER 18, 1968

	#1 Booth St. Bridge 8/21	Booth St. Bridge 9/17	#2 Boynton Lane Br. 8/21	Boynton Lane Br. 9/17	#6 Vista Gage 8/21	#8 Lockwood Bridge 8/21
Turbellaria (Flatworms)	.8	1.0	.6	1.3	--	6.6
Oligochaeta (Roundworms)	.2	--	.1	1.2	5.9	12.0
Hirudinea (Leeches)	--	--	--	--	--	--
Amphipoda (Amphipods)	--	--	--	--	--	1.3
Astacidae (Crayfish)	.1	.2	.1	--	--	.2
Ephemeroptera (Mayflies)	48.6	40.3	39.6	44.0	1.2	16.0
Plecoptera (Stoneflies)	.3	.4	1.3	.2	--	--
Trichoptera (Caddisflies)	30.1	39.5	52.8	42.9	1.2	48.3
Zygoptera (Damselflies)	--	--	--	--	--	--
Pyralididae (Aquatic Moths)	--	1.3	.1	.1	--	--
Elmidae (Riffle Beetles)	.5	.3	--	.3	--	.3
Diptera (True Flies)*	(19.4)	(17.0)	(5.4)	(10.0)	(91.7)	(15.3)
Tipulidae (Crane Flies)	3.6	1.5	.2	--	2.4	--
Simuliidae (Black Flies)	2.5	3.2	.5	2.6	--	1.1
Chironomidae (True Midges)	13.1	12.3	4.7	7.4	89.3	14.2
Empididae (Dance Flies)	.2	--	--	--	--	--
Gastropoda (Snails)	--	--	--	--	--	--

* Figures in parentheses are percentage sums of Diptera families.

Table 12. - BENTHIC INVERTEBRATES OF LOWER TRUCKEE RIVER:
PERCENT OCCURRENCE BY MAJOR TAXONOMIC GROUP (Continued)

RENO-PYRAMID LAKE, AUGUST 21 - SEPTEMBER 18, 1968

	#9 Patrick Siding 9/17	#10 Above Tracy P.P. 9/17	Below Tracy 9/17	#13 Derby Impndmt 9/17	#14 Below Derby 9/17	#17 S-Bar-S 9/18
Turbellaria (Flatworms)	2.9	2.8	--	.6	16.6	43.4
Oligochaeta (Roundworms)	--	4.0	--	6.5	3.2	13.0
Hirudinea (Leeches)	--	1.6	--	.3	.2	--
Amphipoda (Amphipods)	.9	9.5	--	--	--	1.9
Astacidae (Crayfish)	.1	.2	--	--	.2	--
Ephemeroptera (Mayflies)	20.0	60.3	8.8	.9	16.1	6.7
Plecoptera (Stoneflies)	--	.4	--	--	--	--
Trichoptera (Caddisflies)	69.3	14.6	3.8	2.8	47.1	3.5
Zygoptera (Damselflies)	--	--	--	--	.2	.5
Pyralididae (Aquatic Moths)	.4	--	--	--	2.9	.4
Elmidae (Riffle Beetles)	--	--	--	--	--	--
Diptera (True Flies)	(6.4)	(6.6)	(87.4)	(88.9)	(13.5)	(24.1)
Tipulidae (Crane Flies)	--	--	--	--	--	--
Simuliidae (Black Flies)	.2	.8	.4	--	--	1.2
Chironomidae (True Midges)	6.2	5.8	87.0	88.9	13.5	22.9
Empididae (Dance Flies)	--	--	--	--	--	--
Gastropoda (Snails)	--	--	--	--	--	6.5

Table 13. - CHEMICAL ANALYSIS PYRAMID LAKE - SEPTEMBER 19, 1968

Station:	1	2	3	4
Depth (ft)	70	150	20	180
EC (umhos/cm)	9000	9000	8500	8900
TDS (mg/l)	5400	5300	5470	5270
Total P (mg/l)	.075	.10	.055	.12
Ortho P (mg/l)	.08	.107	.057	.12
NH_3-N (mg/l)	.08	.15	.08	.19
Org-N (mg/l)	.59	.63	.38	.53
NO_3-N (mg/l)	.02	.14	.02	.14
Hardness (mg/l)	204	199	206	197
Na (mg/l)	1720	1750	1690	1690
K (mg/l)	105	115	116	104
B (mg/l)	11.3	10.8	11.4	11.8

Table 14. - FIELD DATA FROM PYRAMID LAKE, OCTOBER 9, 1968

Depth (ft)	Temp (°C)	D.O. (mg/l)
Station 1		
Sfc	--	7.8
30	--	7.8
80	--	6.2
120	--	6.6
160	--	5.7
Station 2		
Sfc	16.5	7.9
40	--	7.9
70	16.2	--
75	16.1	--
80	14.2	--
90	9.1	6.4
100	8.3	--
120	7.1	--
140	6.5	7.3
160	6.2	--
200	5.7	--
220	--	6.1
250	5.5	--
300	5.5	--
310	--	2.4
320	5.6	--

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH
Station 3			
Sfc	--	7.8	9.05
30	--	7.9	8.87
70	--	6.9	8.87
120	--	5.5	9.05
170	--	5.4	9.10
Station 4			
Sfc	16.7	7.9	9.25
30	--	7.8	9.20
60	16.5	--	--
70	16.5	--	--
73	16.0	--	--
75	14.4	--	--
80	10.6	6.4	9.25
90	8.2	--	--
100	7.6	--	--
120	6.8	5.0	9.15
150	6.2	--	--
160	--	3.8	9.05
165	6.0	--	--

Secchi depths:

Station	Feet
1	16
2	18
3	15

Table 15. - LABORATORY DATA FROM PYRAMID LAKE, OCTOBER 9, 1968

	Station 1					Station 2					
Depth (ft):	Surface	30	80	120	160	Surface	40	90	140	220	310
EC (μmhos/cm)	8900	8900	8750	8870	8700	8900	8900	8700	8630	8630	8670
TDS (mg/l)	--	--	--	--	--	--	--	--	--	--	--
Total P (mg/l)	.08	.07	.09	.11	.10	.08	.12	.14	.14	.13	.15
Ortho P (mg/l)	--	--	--	--	--	--	--	--	--	--	--
NH_3-N (mg/l)	.05	.05	<.05	<.05	<.05	.05	.05	.05	.05	.05	.05
Org-N (mg/l)	.53	.34	.38	.41	.35	1.1	.56	.35	.43	.51	.43
NO_3-N (mg/l)	.02	.05	.17	.12	.28	.02	.04	.04	.17	.32	.20

Table 15. - LABORATORY DATA FROM PYRAMID LAKE, OCTOBER 9, 1968 (Continued)

	Station 3						Station 4				
Depth (ft):	Surface	30	70	120	170	255	Surface	30	80	120	160
EC (umhos/cm)*	8820 (9000)	9000	8820	8570	8550 (9000)	8630	8800	8800	8700	8530	8610
TDS (mg/l)	5540	--	--	--	5300	--	--	--	--	--	--
Total P (mg/l)	.16	.07	.09	.15	.12	.19	.10	.12	.16	.15	.17
Ortho P (mg/l)	.10	--	--	--	.13	--	--	--	--	--	--
NH_3-N (mg/l)	.05	.05	.05	.05	.05	.05	.05	.05	.05	.09	.05
Org-N (mg/l)	.78	.50	.31	.41	.36	.34	.40	.35	.43	.32	.31
NO_3-N (mg/l)	.02	.02	.04	.16	.16	.16	.02	.07	.20	.14	.14
Hardness (mg/l)	205	--	--	--	199	--	--	--	--	--	--
Na (mg/l)	1670	--	--	--	1620	--	--	--	--	--	--
K (mg/l)	124	--	--	--	115	--	--	--	--	--	--
B (mg/l)	12.8	--	--	--	11.8	--	--	--	--	--	--

* Specific conductivity values not in parentheses analyzed independently.

Table 16. - WATER QUALITY TRENDS IN PYRAMID LAKE

Year:	1882	1933	1951	1955	1959	1964	1966	1968
Iron	--	trace	.04	.00	.04[a/]	0.01	0.07	
Calcium	8.9	--	8.0	10	7.2	8.8	9.4	
Magnesium	79.7	--	111	113	117	121	118	
Sodium	1179.6	--	1540	1630	1630	1770	1790	1645
Potassium	73.3	--	160	134	120	120	136	120
Carbonate	499.0	276	280	230	213	236	253	
Bicarbonate	--	630	830	920	939	1020	1000	
Sulfate	182.2	--	265	264	274	266	289	
Chloride	1430	1704	1920	1960	1980	2080	2100	
Fluoride	--	--	2.9	0.8	1.5	2.0	1.8	
Boron	--	--	12	12	--	12	13	12
TDS	3486.1	(3980)*	4700	4810	5130	5220	5200	5420**
EC (μmhos)	--	--	7660	8010	7680	8420	8700	
Hardness	--	--	476	490	499	520	507	
pH	--	9.0	9.2	9.1	8.9	9.4	9.1	9.1
Phosphorus (total)	--	--	--	--	--	--	--	0.12 av
Orthophosphate	--	--	--	--	0.13	--	0.06	
Nitrogen (total)	--	--	--	--	--	--	--	0.58
Nitrate (as N)	--	--	0.41	0.36	--	0.54	0.18	

* Computed from chloride/conductivity ratio.
a/ dissolved.
** Volume weighted average.

Note: All analysis reported as mg/l unless noted.

Table 17. - CARSON RIVER FIELD MEASUREMENTS

Station	Date	Time	D.O. (mg/l)	EC (μmhos/cm)	Turbidity (JTU)	pH	Temp (°C)
Weeks	9-9-66	--	8.1	--	--	7.6	16.0
	8-22-68	1230	--	625	--	--	16.0
New Empire (CR-2)	8-21-69	1615	9.4	460	15	7.9	29.0
Hwy. 395 Bridge (CR-1)	8-21-69	1440	6.8	340	19	7.8	26.0

Table 18. - LABORATORY MEASUREMENTS FROM CARSON RIVER SAMPLES

Date	Time	Total PO_4 (mg/l)	Ortho PO_4 (mg/l)	NH_3-N (mg/l)	NO_3-N (mg/l)	Org-N (mg/l)
Weeks						
9-9-66	--	--	0.05	neg.	trace	0.20
8-22-68	--	0.80	0.57	--	--	0.16
New Empire (CR-2)						
8-12-69	1610	1.7	1.4	0.26	0.29	1.1
8-14-69	1210	1.9	1.6	0.23	0.32	1.5
8-21-69	--	1.8	1.45	--	0.36	--
10-2-69	--	--	1.04	0.22	0.07	0.62
11-20-69	0715	0.86	0.71	0.14	0.15	0.44
Highway 395 Bridge (CR-1)						
8-12-69	1530	0.92	0.78	0.09	0.18	0.73
8-14-69	1230	1.05	0.39	0.13	0.18	0.70
8-21-69	--	1.00	0.82	--	0.32	--
11-20-69	0745	0.61	0.52	<0.06	0.20	0.22
Genoa Lane Bridge (CR-3)						
10-3-69	--	--	0.31	<0.08	0.06	0.96
11-20-69	0830	0.74	0.52	0.12	0.15	0.32
West End Muller Lane (CR-4)						
11-20-69	0900	0.31	0.28	<0.06	0.09	0.30
East End Muller Lane (CR-5)						
11-20-69	0920	1.08	0.95	<0.06	0.25	0.80

Table 19. - MISCELLANEOUS LABORATORY MEASUREMENTS FROM CARSON RIVER SAMPLES AT WEEKS

Date	9-9-66	Date	8-22-68
BOD_5 (mg/l)	1.0	EC (μmhos/cm)	590
Chlorides (mg/l)	13.0	TDS (mg/l)	385
Alkalinity (mg/l)	192	Hardness (mg/l)	75.0
HCO_3 (mg/l)	234	Na (mg/l)	44.0
		K (mg/l)	4.2
		B (mg/l)	0.50
		SS_I (mg/l)	0.10

Table 20. - FIELD AND LABORATORY MEASUREMENTS FROM "V" CANAL STATION

Date	8-21-68
Temp. (°C)	20.0
Turbidity (JTU)	50
EC (μmhos/cm)	290
TDS (mg/l)	180
Total P (mg/l)	0.22
Ortho as P (mg/l)	0.137
NH_3-N (mg/l)	0.33
Org-N (mg/l)	0.62
NO_3-N (mg/l)	0.18
Hardness (mg/l)	32.0
Na (mg/l)	22.0
K (mg/l)	3.4
B (mg/l)	0.32
SS_I (mg/l)	0.06

Table 21. - WATER QUALITY STANDARDS FOR CARSON RIVER CONTROL POINTS

	Muller Lane (CR-5)	Hwy 395 (CR-1)	New Empire (CR-2)	Weeks
Temp (°C)				
June-Sept avg. not more than	20	20	21	21
summer not more than	30	30	30	30
winter not more than	14	14	14	14
pH units				
annual median within range	7.5-8.0	7.5-8.0	7.5-8.0	7.4-7.8
single value within range	6.5-8.5	6.5-8.5	6.5-8.5	7.0-8.2
D.O. (mg/l)				
June-Sept avg. not less than	7.0	7.0	7.0	7.0
single value not less than	6.5	6.5	5.5	6.5
BOD (mg/l)				
single value not less than	10	10	15	5
Chlorides (mg/l)				
single value not more than	15	20	30	40
PO_4 (mg/l)				
annual average not more than	0.10	0.5	1.0	0.3
single value not more than	0.15	1.0	2.0	0.5
NO_3 (mg/l)				
single value not more than	2.0	2.0	2.0	2.5
TDS (mg/l)				
annual average not more than	250	275	450	300
single value not more than	300	300	600	450

* From State of Nevada Water Pollution Control Regulations, amended July 1, 1967.

Table 22. - LAHONTAN RESERVOIR FIELD MEASUREMENTS, AUGUST 1968

Station	Date	Time	Depth	EC (µmhos/cm)	Turbidity	Chlorophyll (µg/l)	Secchi (ft)	Temp (°C)
Near Dam at North end	8-22	1130	Sfc	--	55	8.5	--	20.0
	8-22	--	12 m	60	60	8.2	--	18.8
East end of Narrows	8-22	1605	--	--	--	--	2.0	--
Silver Springs	8-22	1430	Sfc	--	200	27	--	--
	8-22	--	Bottom	--	200	--	--	--

RESPIRATION RATES BASED ON LIGHT-DARK BOTTLE EXPERIMENTS*, AUGUST 1968

Station	Date	Depth (m)	D.O. (mg/l)	Respiration rate (mg/l/hr)	Duration of resp. test (hr)
Near Dam at North end	8-22	Sfc	6.80	0.011	9.0
	8-22	12.0	6.62	0.01	9.0
Silver Springs	8-22	Sfc	8.90	0.020	5.0
	8-22	4.5	7.22	0.004	5.0

* Time of experiments unknown.

Table 23. - LABORATORY MEASUREMENTS FROM LAHONTAN RESERVOIR SAMPLE, 1968

Station:	Near Dam at North end		East end of Narrows		Silver Springs	
Date	8-22		8-22		8-22	
Time	--	1155	--	--	--	--
Depth	Sfc	12 m	Sfc	Bottom	Sfc	Bottom
EC (μmhos/cm)	280	280	330	390	325	320
TDS (mg/l)	170	175	210	210	215	205
Total P (mg/l)	0.185	0.215	0.365	0.540	0.550	0.625
Ortho P (mg/l)	0.100	0.113	0.230	0.240	0.247	0.263
NH_3-N (mg/l)	0.18	0.34	0.09	--	0.30	0.17
Org-N (mg/l)	0.63	1.30	0.41	0.34	1.10	0.69
NO_3-N (mg/l)	0.11	0.16	0.36	0.42	0.35	0.34
Hardness (mg/l)	32.5	32.5	35.0	36.0	37.0	36.0
Na (mg/l)	21.0	21.0	25.0	25.0	26.0	26.0
K (mg/l)	3.3	3.4	3.5	3.8	3.7	3.7
B (mg/l)	0.22	0.24	0.26	0.25	0.26	0.22
SS_I (ml/l)	0.02	0.01	<0.01	0.01	0.01	0.15

Table 24. - FIELD AND LABORATORY MEASUREMENTS FROM LAHONTAN RESERVOIR SAMPLES, 1966

Station:	Near Dam at North end	East end of Narrows	Silver Springs	South end of Silver Springs
Date	9-1	9-1	7-14	7-14
Temp (°C)	--	--	14.0	17.0
pH	8.2	8.2	--	--
D.O. (mg/l)	5.1	6.4	7.6	7.8
BOD_5 (mg/l)	0.1	0.2	0.5	1.3
Total P (mg/l)	.16	.18	0.1	.09
NO_3-N (mg/l)	trace	3.2	trace	1.2
Org-N (mg/l)	0.14	0.17	0.34	0.20
NH_3-N (mg/l)	neg.	neg.	neg.	neg.

Table 25. - FLOW-THROUGH AND STORAGE DATA FOR LAHONTAN RESERVOIR

Location of Gaging Station	Monthly Discharge Volume (ac-ft) August	September	Mean Rate (cfs) August	September
Entering Reservoir				
Truckee-Carson Canal near Hazen (5 miles from reservoir)	9080	9201	147.7	154.6
Carson River near Weeks	40	49	0.65	0.82
Leaving Reservoir				
Carson River near Fallon (about 10 miles downstream from dam)	48,010	42,810	781	719
Rock Dam Ditch	531	1,011	8.6	16.4

Lahontan Reservoir Storage Volumes (ac-ft)

August 22, 1968	137,034
September 22, 1968	95,545
Daily average for August 1968	144,017
Daily average for September 1968	104,620
Maximum for 1968	261,995
Minimum for 1968	90,336

* From USBR Hydrologic, Stream Flow and Operation Data, Truckee and Carson River Systems. Samples taken in August and September, 1968.

Table 26. - WATER QUALITY STANDARDS FOR EXISTING SAMPLING POINTS IN LAHONTAN RESERVOIR

Temp (°C)		
June-Sept avg.	not more than	25
summer	not more than	30
winter	not more than	14
pH units		
annual median	within range	7.5-8.0
single value	within range	6.5-8.5
D.O. (mg/l)		
June-Sept avg.	not less than	6.5
single value	not less than	5.5
BOD (mg/l)		
single value	not more than	2
PO_4 (mg/l)		
annual average	not more than	0.40
single value	not more than	0.60
NO_3 (mg/l)		
single value	not more than	4.0
TDS (mg/l)		
pending further analysis		
MF Coliform/100 ml (Average of the last five samples)		
Maximum value of 1000, if MF Fecal Streptococci are less than 100.		
Maximum value of 5000, if MF Fecal Streptococci are less than 20.		
Chlorides (mg/l)		
single value held for additional analysis		

* From State of Nevada Water Pollution Control Regulations, amended, July 1, 1967.

Table 27. - CHANGES IN ELEVATION OF PYRAMID LAKE SURFACE LEVEL, 1904-1967*

	Years	Change (ft.)
	1904-1909	+ 7
	1909-1914	- 3
	1914-1917	- 5
	1917-1922	- 5
	1922-1927	- 9
	1927-1932	-15
	1932-1937	-14
	1937-1942	+ 1
	1942-1947	- 6
	1947-1952	- 3
	1952-1957	- 7
	1957-1962	-12
	1962-1966	- 5
	1966-1967	+ 3
Total:	1904-1967	-73

* Taken from: Wheeler, Session S., The Desert Lake, 1968, pp. 183.